FACTORY

MANAGEMENT AND MAINTENANCE

JUNE 1947

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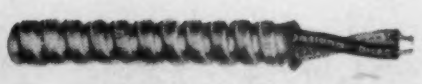

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FACTORY

MANAGEMENT and MAINTENANCE

JUNE, 1947

production • maintenance • labor management

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WORLD LEADERSHIP...

Our Duty and Our Opportunity

CAPITALISM in Europe and the rest of the world is challenged by a real and formidable rival, communism. For capitalism to thrive a reasonable amount of prosperity is essential. Communism uses poverty to advance itself.

Except for the Western Hemisphere, most of the world came out of the war poor. Two years after V-E Day it is still poor. It needs dollars. It needs credit. It needs capital. It needs trade. It needs technical and managerial skills.

If we in America are to help the rest of the world back to its feet, starting it again on the road to peace and a free economy, we should try to supply those needs within the limits of our capacity.

We must not overtax our own strength. For the first requirement of a stable world is a strong United States. But we must accept leadership in international economic recovery—in our own self-interest.

What can the United States do to help men back to prosperity in a world economy which will allow them *freedom and incentive?* There are many things. But here are two of the most important:

1. The United States, through Congress, must determine the pattern and the total of the foreign loans or grants it can afford. We must answer three questions. How much will the new program cost? Can we afford it? Have we the technicians and managers to watch the loans, assuring their fruitful use?
2. We must demonstrate that we do not intend to raise our tariff walls to prohibitive heights when our debtors begin to repay us in goods and services, which is the only practical way they can pay us. Otherwise our loans will become losses.

If the United States is to meet even the minimum requirements of world rehabilitation, Congress eventually must authorize more advances than those to Greece and Turkey. The $400 million for those two countries will not do the over-all job of political and economic defense which we have begun. A minimum of $5 billion, if promptly and wisely applied in eight to ten countries, might suffice. BUT this $5 billion will be on top of approximately $16.8 billion which we have spent or earmarked during the past two years for use abroad, including our full share of the World Bank and Fund. We shall do a faster and more effective job if Congress will thus add up the foreseeable total of our international aid, and, even though the total looks imposingly large, commit us to it, with proper collateral safeguards from the debtor nations.

Congress need not try to foretell all contingencies, like last winter's weather in Britain, and it certainly should not create the impression that nations need only ask for billions to receive them. On the other hand, the war should have taught us the miserable consequences of "too little and too late." The President should have learned that he engenders skepticism by going to Congress with parts of a program, as he has done in the British, Grecian and Turkish loans. Within the limits of our capacity, we must make the decision now to see the whole job through—or throw in the sponge.

In the interest of the debtor nations—as well as in our own interest—the loan program should be hard-boiled. Rehabilitation loans must really rehabilitate. They must produce a state of economic health which will permit the World Bank and private capital to take over the task of financing world recovery—as perhaps can be done today in France and the Low Countries.

The loans, therefore, must be within the limits of our technical and managerial ability to implement them. Without technical help, Greece can not use its loan effectively—to rebuild railroads, clear ports, revive agriculture. Without skilled supervisors, Germany can not be made to pay its way. Money alone won't pull China from the brink of economic chaos.

Our lending calls for more than money. It calls for trained personnel to help the recipients utilize the loans effectively—geologists, construction and sanitary engineers, monetary experts, and management and agricultural specialists.

Loans are necessary but they are only a first step. A long-range program requires the opening of the half-closed doors of world trade—our own door, too.

We will have to get used to the idea that, when our debtors pay us, they must pay us largely in goods and services. Refusal to permit such repayments in the twenties helped start the world depression in the thirties—and the loss of our investments. *Imports do tend to raise living standards, and a two-way trade program need not require us to slash our present tariff rates.*

The complexion of our foreign trade has changed since the war. Our manufacturing capacity has increased and our raw-material self-sufficiency is tending to decline. For example, we probably shall have to continue importing copper and zinc and to increase our prewar dependence on imported lead. We may soon have to depend heavily on imported oil, and—gradually—on a growing volume of iron ore from abroad. Our normal dependence on imports for commodities like rubber, tin and silk will continue.

Our population has gone up 10 million in the last decade, and we now have a $176 billion national income, making room for more imports.

As a result of every nation's recent attempts to make itself secure and self-sufficient by slamming its trade door, a world-wide series of quotas and restrictions is blocking international trade. Even more, government buying and selling threaten to take commerce out of the hands of private traders, placing it in the uninspired care of bureaucratic negotiators.

Our government has taken the lead in calling the conference of 18 nations, now meeting at Geneva, to open as many trade doors as possible. The American delegates will bargain product by product and country by country—all summer, if necessary—for lower tariffs, fewer quotas and a free flow of *private* trade. The task is a long one, and the results are as yet uncertain, but, if success is achieved, an immense opportunity for good works and good earnings will lie before American businessmen.

This is no picayunish opportunity. Authoritative estimates put our 1947 exports at $11 billion and our imports at $6 billion. That's substantial. It is greater than the value of all crops grown on our farms ($10½ billion) and exceeds the value of all shipments of industries such as automobiles ($9 billion), textiles ($8 billion) and chemicals ($8 billion).

International trade is vital, not to be shrugged off, not to be kicked around as a football of party politics. Republicans and Democrats agree on a non-partisan foreign *political* policy. They should agree also on a non-partisan foreign *economic* policy. The foreign relations of the United States, political or economic, can no longer be log-rolled hither and yon.

A general program for international recovery, outlined here, will bring its full quota of aches and pains. But lack of a program will produce economic and political troubles on a vast scale; timid retreat will invite economic disaster and war.

By an intelligent, bold and resourceful program, we have a chance to win through to a long peace in the kind of world we want. *Unless America provides the leadership, there can be no such program.* Then Communism merely needs to hang around long enough to pick up the pieces.

Ours is the responsibility and the opportunity.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

A NEW ENTERPRISE

Advocacy by the McGraw-Hill Publishing Company, in the accompanying editorial, of an effective world economic policy is not a mere verbal exercise. In the faith that we as a nation shall develop such a policy, this Company, following a trail blazed by leaders in American industry and finance, is expanding its operations overseas.

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THIS IS THE 58TH OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

WORKING WON'T BRING DEPRESSION

America, at this time, cannot *work* itself into a depression. It can *loaf* itself into one, or *price* itself into one, or *talk* itself into one. But not *work* itself into one.

There still is so much to do that, work as hard as it can, this country will not be able to supply the existing wants of today. Furthermore, before they could be filled, new ones would arise.

Consider the figures Henry Ford gave at the Chamber of Commerce meeting recently: Fifty per cent of the farm homes in the United States, and 10 per cent of all homes do not have electricity; one-third of the users of electricity have no electric refrigerators, and 40 per cent do not have washing machines; 58 per cent of the nation's homes do not have central heating; 40 per cent of the families do not have a car.

The things listed above are everyday needs about which everyone knows. But how about the new needs that have not even been born? What is ahead in *new* things that will be luxuries at first, but commonplaces in no time at all?

Only a few decades ago automobile, electric refrigerator, radio, airplane, were nothing but words. Today they represent necessities in the nation's life. The automobile alone means something like 2,000,000 jobs.

Today there are other "words" that are little else to most of us. What will they represent a few years hence? The Bank of the Manhattan Company lists these significant words, in part, as follows: "Electronics, fluorescence, super-octane gasoline, turbo-supercharger, gas turbine, supersonic and jet planes, powder metallurgy, centrifugal forging, sulpha, penicillin, streptomycin, germicidal lamps, frequency modulation, facsimile reproduction, television, quick freezing, home freezer, flame weeder, cotton picker, precision planting, seed pelleting."

These words forecast new industries. There is no telling how many jobs they will be responsible for. During the 50 years from 1879 to 1929, a million new jobs were created in the manufacture of products not known before 1879. Since 1929 those jobs have multiplied greatly. And still other products developed since 1929 are responsible for still more jobs.

Always too many of the people in industry have held back because they were afraid. Just about 100 years ago it was the conviction of the U. S. Commissioner of Patents that the end of human improvement had been reached. The end of humanity itself would be reached—and quickly—if the population of today had to depend upon the production of a hundred years ago.

These betterments of a hundred years have come about as a result of work. There has been less and less work put in per unit of product as time has gone on, but more products have been made. More people have had them. The way of work is the way of more goods for more people at lower prices.

L. C. Morrow

WORKERS APPROVE

- Giving the government power to act when strikes threaten the public welfare
- Providing better methods to settle labor disputes
- Limiting unions powers, fixing union responsibilities
- Requiring democratic methods in unions
- Allowing freedom of speech, short of threats, to employers
- Requiring unions to register with the federal government
- Prohibiting strikes of federal government workers
- Putting unions under the anti-trust laws

WORKERS ARE DIVIDED ON

- Outlawing the closed shop
- Allowing employers to get injunctions
- Making unions liable for damages caused employers
- Setting up a new federal mediation board

WORKERS DISAPPROVE

- Prohibiting the union shop
- Limiting powers national unions hold over their locals
- Prohibiting employer contributions to worker-welfare funds
- Allowing employers to replace strikers

Congress's prescription for labor peace will not automatically end labor-management troubles.

Workers want many changes in federal labor laws—but they resist some of the major proposals advanced by Congress.

A nationwide survey by FACTORY shows that workers in the manufacturing industries approve changes that would control strikes threatening the public welfare. They want better methods of settling labor-management disputes. By large majorities they accept provisions that would restrict union powers, fix union responsibilities, and insure democratic methods in union operations. A majority would prohibit strikes by employees of the federal government.

But workers are divided on such major changes as outlawing the closed shop, allowing employers to get injunctions, making unions liable for damages they cause employers, and setting up a new federal mediation board.

And workers vote against labor law changes that would end industry-wide bargaining, and prohibit employer contributions to worker-welfare funds. They disapprove restrictions that would limit the power national and international unions exercise over their locals. They reject by 4 to 1 the idea that employers should be allowed to hire permanent replacements for strikers seeking economic demands.

These are the chief findings of a FACTORY survey of workers in the manufacturing industries across the country. The poll was made for FACTORY by the McGraw-Hill Research staff.

Correspondents personally interviewed workers. Interviews were accurately sampled geographically, by union affiliation, by age, by sex, by race, and by size and type of company in which workers were employed. Survey results are representative of worker opinion in the manufacturing industries.

How workers feel about the major provisions of the Congressional prescription is shown in the response to these questions:

1. Should the closed shop be prohibited by law? The closed shop, of course, is a shop where a man must belong to the union *before he can get a job*

Workers split on this question, perhaps the most controversial of all labor proposals. Forty-four per cent approve, 45 per cent disapprove, 11 per cent have no opinion.

2. Should the union shop be prohibited by law? The union shop is a shop where a man must join the union *after he gets a job.*

Only one worker in five approves prohibition of the union shop. Seventy-two per cent—three out of four—reject the provision.

3. Would you approve the union shop in plants where a majority of all workers voted for it? (Asked only of those who thought the union shop should be prohibited.)

This modification of the union shop, as provided for in both the House and Senate bills, is approved by 68 per cent of the workers who otherwise express their dislike of the union shop.

4. Do you think industry-wide bargaining should be prohibited? Industry-wide bargaining is bargaining where one union deals for all the workers in an industry with all the employers in that industry.

Twenty-seven per cent of all workers vote "yes" to this change; 57 per cent, "no."

5. If a strike threatens the public health, safety, or interest, should the government be allowed to get a court order to delay the strike 75 days?

Key proposal to control strikes in public utilities and other essential services, it is approved by 59 per cent.

6. Should an employer be allowed to get a court order to stop an illegal strike?

Bitterly condemned by labor leaders, this proposal divides workers. Forty-nine per cent approve; 28 per cent disapprove. Many of the 23 per cent who gave no opinion hesitated over the definition of "illegal," according to correspondents.

7. Should a union and an employer be required by law to hold five meetings to try to settle a dispute during the 30 days before a strike could be called?

"Yes," say 86 per cent of all workers.

8. Should the law say a strike could not be called unless a majority of the workers have voted for it?

"Yes," say 84 per cent. High responses to this question, and to Question 7, were registered by all groups of workers all over the country.

9. Should it be permissible for a union to sue an employer for breaking a labor contract?

Replies to this question show quite a difference in the thinking of union and non-union workers. Seventy-five per cent of union workers, only 53 per cent of non-union workers, approve.

10. Should it be permissible for an employer to sue a union for breaking a labor contract?

Designed to fix union responsibility for contracts, this proposal is approved by 69 per cent of all workers.

11. Do you think unions should be required to bargain (as employers are) on questions of wages, hours, and working conditions?

Eighty per cent approve this provision, which was designed to correct an omission in the National Labor Relations Act.

12. Should it be illegal for a union to force an employer to hire more people than he needs?

"Yes," say 71 per cent.

Among the 22 per cent who "don't know" what to answer to this question are some who believe work should be stretched out, say field correspondents.

CONTINUED ON NEXT PAGE

FACTORY'S *summary of worker opinion on labor law changes*

	ALL WORKERS			
	Yes	No	Don't Know	Yes
1. Should the closed shop be prohibited by law?	44	45	11	39
2. Should the union shop be prohibited by law?	20	72	8	15
3. Would you approve the union shop in plants where a majority of all workers voted for it? (Asked only of those who thought union shop should be prohibited)	68	27	5	72
4. Do you think industry-wide bargaining should be prohibited?	27	57	16	23
5. If a strike threatens the public health, safety or interest, should the government be allowed to get a court order to delay the strike for 75 days?	59	28	13	53
6. Should an employer be allowed to get a court order to stop an illegal strike?	49	28	23	38
7. Should a union and an employer be required by law to hold five meetings to try to settle a dispute during the 30 days before a strike could be called?	86	9	5	86
8. Should the law say that a strike could not be called unless a majority of the workers have voted for it?	84	12	4	83
9. Should it be permissible for a union to sue an employer for breaking a labor contract?	68	23	9	71
10. Should it be permissible for an employer to sue a union for breaking a labor contract?	69	19	12	70
11. Do you think unions should be required to bargain (as employers are) on questions of wages, hours, and working conditions?	80	9	11	81
12. Should it be illegal for a union to force an employer to hire more people than he needs?	71	22	7	69
13. Do you think union initiation fees should be limited to no more than $25?	78	12	10	71
14. Should unions be required to hold elections of officers?	95	2	3	91
15. Should unions be required to report to their members on finances?	95	2	3	91

INDICATES MAJORITY APPROVAL

ALL FIGURES SHOWN ARE PERCENTAGES

UNION WORKERS			NON-UNION WORKERS		
Yes	No	Don't Know	Yes	No	Don't Know
39	51	10	56	29	15
15	80	5	31	57	12
72	24	4	64	29	7
23	63	14	35	44	21
53	34	13	74	14	12
38	34	28	74	14	12
86	11	3	87	6	7
83	14	3	86	7	7
75	18	7	53	34	13
70	19	11	66	20	14
81	10	9	77	7	16
67	25	8	78	16	6
78	13	9	79	8	13
97	1	2	91	3	6
96	2	2	93	2	5

CONTINUED ON NEXT PAGE

13. Do you think union initiation fees should be limited to no more than $25.

Seventy-eight per cent approve this limitation. Correspondents report that many thought $25 was far too much.

14. Should unions be required to hold elections of officers?

Ninety-five per cent—about as close to unanimous opinion as is ever reported in large surveys—believe union officers should be elected.

15. Should unions be required to report to their members on finances?

Again 95 per cent speak in favor of requiring democratic methods.

16. Do you think unions should be required to take secret votes among their members on elections, strikes, dues, and assessments?

Sixty-one per cent say "yes" on elections, 58 per cent on strikes, 53 per cent on dues, and 53 per cent on assessments.

17. Should foremen be considered a bargaining unit under the National Labor Relations Act?

Important both to unions and to management, this is accepted by only 33 per cent of all workers. Forty per cent reject it; 27 per cent have no opinion. On this basis the ban on supervisory bargaining should be accepted by workers.

18. Should employers be allowed to sue a union or its members for damages caused by the use of force or violence, mass picketing, sympathy strikes, sitdown strikes, jurisdictional strikes, and secondary boycotts?

Workers—by a majority of 70 per cent—say unions should be liable for damages caused by use of force or violence. Fifty-three per cent approve liability for mass picketing. But only 47 per cent say so for sympathy and sitdown strikes. In the case of jurisdictional strikes and secondary boycotts, approvals are given by 42 and 39 per cent, respectively. Percentages of those who have no opinion are high on the jurisdictional strike and secondary boycott questions, however. One worker in four had no answer, indicating that many did not recognize the terms.

19. Should employers be prohibited from contributing to worker-welfare funds where funds are controlled exclusively by unions? Should contributions be prohibited where control of funds is shared by unions and employers?

Workers disapprove any prohibitions on contributions to welfare funds.

Only 28 per cent approve in the case of union-controlled funds, 20 per cent in the case of jointly controlled funds.

20. Do you believe that national and international

CONTINUED FROM PREVIOUS PAGE

FACTORY'S *summary of worker opinion on labor law changes*

	ALL WORKERS			
	Yes	No	Don't Know	Yes
16. Do you think unions should be required to take secret votes among their members on:				
Elections?	61	32	7	63
Strikes?	58	35	7	60
Dues?	53	39	8	55
Assessments?	53	38	9	55
17. Should foremen be considered a bargaining unit under the National Labor Relations Act?	33	40	27	34
18. Should employers be allowed to sue a union or its members for damages caused by: The use of force or violence?	70	20	10	6
Mass picketing?	53	36	11	4
Sympathy strikes?	47	40	13	4
Sitdown strikes?	47	38	15	4
Jurisdictional strikes?	42	34	24	3
Secondary boycotts?	39	36	25	3
19. Should employers be prohibited from contributing to worker-welfare funds:				
Where funds are controlled exclusively by unions?	28	53	19	2
Where control of funds is shared by unions and employers?	20	60	20	2
20. Do you believe that national and international unions should be barred by law from telling their locals what to do in regard to bargaining and strikes?	37	49	14	3
21. Should unions be put under the anti-trust laws the same as employers?	51	23	26	4
22. Should unions that have Communists as officers be prohibited from representing workers?	77	15	8	7
23. Should employers have freedom to discuss union questions with workers as long as they do not threaten them?	89	8	3	8
24. Do you approve setting up a new federal conciliation service outside of the Labor Department to settle labor disputes?	49	32	19	4
25. Should employers be allowed to hire workers — not strikebreakers, but permanent employees — to take the place of workers on strike for higher wages?	18	75	7	
26. Should craft units (such as carpenters) be allowed to bargain for themselves in a plant where all workers have been represented by one industrial union?	46	38	16	
27. Do you think unions should have to register with the federal government each year, giving a detailed financial report and the names and salaries of their officers?	65	25	10	
28. Should employees of the federal government be prohibited from striking?	57	30	13	

INDICATES MAJORITY APPROVAL

ALL FIGURES SHOWN ARE PERCENTAGES

	UNION WORKERS			NON-UNION WORKERS		
	Yes	No	Don't Know	Yes	No	Don't Know
7	63	32	5	54	34	12
7	60	35	5	52	34	14
8	55	40	5	50	35	15
9	55	40	5	48	35	17
27	34	43	23	31	34	35
10	67	23	10	80	12	8
11	47	42	11	65	24	11
13	40	46	14	64	27	9
15	42	43	15	58	26	16
24	38	39	23	52	23	25
25	34	41	25	50	24	26
19	26	56	18	30	47	23
20	20	63	17	23	52	25
4	32	56	12	46	33	21
6	46	29	25	61	10	29
3	76	16	8	79	14	7
3	86	10	4	94	3	3
9	47	34	19	52	27	21
7	13	82	5	30	60	10
6	45	41	14	47	31	22
0	62	28	10	73	18	9
3	55	33	12	61	23	16

How geographical area affects worker opinion

The questions on which workers in different parts of the country differ most—and the percentage of their "yes" responses	New England	Middle Atlantic	East North Central	South	West
1. Prohibit closed shop bargaining	51	40	45	36	60
4. Prohibit industry-wide	33	23	29	23	32
5. Allow government injunctions	92	78	82	78	89
6. Allow employers injunctions	66	50	65	49	76
11. Require unions to bargain	74	83	78	77	61
12. Ban forcing employers to hire unnecessary workers	79	62	73	72	79
13. Limit union initiation fees	75	73	82	78	81
19. Ban employer contributions to union-controlled welfare funds	21	38	27	16	26
21. Put unions under anti-trust laws	45	55	55	37	61
25. Allow employers to hire permanent replacements for economic strikers	11	21	15	14	39

unions should be barred by law from telling their locals what to do in regard to bargaining and strikes?

Another approach to the industry-wide bargaining problem, this is approved by 37 per cent, rejected by 49 per cent of all workers.

21. Should unions be put under the anti-trust laws the same as employers?

Fifty-one per cent, a bare majority, say they should. However, 26 per cent did not know what to think.

22. Should unions that have Communists as officers be prohibited from representing workers?

Easy to understand, this provision gets a 77 per cent approval among workers.

23. Should employers have freedom to discuss union questions with workers as long as they do not threaten them?

The "freedom of speech" issue, which seems important chiefly to management, is approved by 89 per cent of all workers with 8 per cent dissenting and 3 per cent with no opinion.

CONTINUED ON NEXT PAGE

CIO, AFL, and Independent union members don't see eye to eye

The questions on which members of different unions differ most — and the percentage of their "yes" responses	UNION AFFILIATION AFL	CIO	IND
1. Prohibit closed shop	30	41	50
2. Prohibit union shop	13	16	23
4. Prohibit industry-wide bargaining	24	21	35
6. Allow employers injunctions	54	54	59
7. Hold meetings to settle disputes	85	87	82
9. Allow unions to sue employers	70	77	78
10. Allow employers to sue unions	67	71	75
12. Ban forcing employers to hire unnecessary workers	67	66	76
13. Limit union initiation fees	73	80	81
20. Restrict powers of national unions	29	33	38
21. Put unions under anti-trust laws	42	45	60
22. Ban Communist-led unions	74	73	79
23. Allow employers freedom of speech	89	84	88
24. Set up new conciliation service	39	51	42

How size of plant affects worker opinion

The questions on which workers in plants of different sizes differ most — and the percentage of their "yes" responses	NUMBER OF EMPLOYEES 1-100	101-250	251-500	500+
4. Prohibit industry-wide bargaining	31	27	23	26
6. Allow employers injunctions	68	61	57	57
9. Allow unions to sue employers	68	64	73	75
10. Allow employers to sue unions	67	64	70	71
13. Limit union initiation fees	72	82	79	79
21. Put unions under anti-trust laws	56	47	46	50
25. Allow employers to hire permanent replacements for economic strikers	31	22	11	12

24. Do you approve setting up a new federal conciliation service outside of the Labor Department to settle labor disputes.

Here again mixed opinion is evident. Forty-nine per cent approve; 32 per cent do not; 19 per cent have no opinion.

25. Should employers be allowed to hire workers—not strikebreakers, but permanent employees—to take the place of workers on strike for higher wages?

"No," say three workers out of four. Both union and non-union workers reject the idea by large majorities, but about one non-union worker in three approves, compared to one union member in eight.

26. Should craft units (such as carpenters) be allowed to bargain for themselves in a plant where all workers have been represented by one industrial union?

Workers are of two minds here. Forty-six per cent approve; 38 per cent disapprove; 16 per cent can't make up their minds.

27. Do you think unions should have to register with the federal government each year, giving a detailed financial report and the names and salaries of their officers?

Union leaders protest this, but union members and non-union workers accept it. The all-worker majority approving it is 65 per cent; the union majority, 62 per cent. The non-union workers' vote is 73 per cent.

28. Should employees of the federal government be prohibited from striking?

The right to strike should be denied government workers, say 57 per cent.

Worker opinion, as shown in this survey of the key points of the Congressional "omnibus" bills, clearly does not coincide with the pronouncements of union leaders. William Green, Philip Murray, and other chieftains have consistently claimed that "no new labor legislation is necessary." To back their war cry, they have called the Congressional proposals "slave labor" bills designed to "weaken and destroy" unions. In the AFL's $1,500,000 radio and newspaper advertising campaign, workers and the public were told the Taft-Hartley program would make "dead ducks" of unions.

But workers don't agree with their leaders. They want many of the changes.

Survey results also spotlight the areas in which opinions conflict. They highlight the points in which adjustments may be difficult. If the new law, for instance, restricts national and international unions to functions as limited as those of manufacturer's associations, management may have trouble as local unions adjust their operations to the new basis.

Finally, this survey will be a pretty fair "yardstick" to apply to the question: "How will labor react to the new law?"

UNION CONTRACT CLAUSES

United States, 1946-1947

TYPE OF CLAUSE	NUMBER OF CONTRACTS	PERCENTAGE OF TOTAL
		AFL / CIO / INDEPENDENT
1. Union shop	61	44.3% (27) / 14.7% (9)
2. Maintenance of membership	125	59.2% (74) / 11.2% (14)
3. No union security clause	86	23.3% (20) / 45.3% (39)
4. Preferential hiring	8	25.0% (2) / 12.5% (1)
5. Check-off of union dues	158	58.9% (93) / 10.8% (17)
6. Irrevocable check-off without union security clauses	5	80.0% (4)
7. Strikes prohibited	206	52.4% (108) / 16.5% (34)
8. Lockouts prohibited	203	51.2% (104) / 16.3% (33)
9. Company provides bulletin boards for union notices	163	51.5% (84) / 17.2% (28)
10. Union participation in time studies and incentive programs	35	57.1% (20) / 14.3% (5)
11. Vacations with pay	256	46.5% (119) / 22.7% (58)
12. Plant-wide or company-wide seniority	152	48.7% (74) / 21.7% (33)
13. Departmental seniority	124	50.8% (63) / 16.1% (20)
14. Divisional seniority, by geographical area	20	25.0% (5) / 35.0% (7)
15. Occupational seniority	74	41.9% (31) / 32.4% (24)
16. Arbitration clauses	208	51.0% (106) / 15.9% (33)
17. Arbitration award binding on union and management	186	52.7% (98) / 14.5% (27)
18. Expenses of arbitration to be shared jointly	143	55.2% (79) / 17.4% (25)

INDUSTRY	NUMBER OF CONTRACTS
Airlines	20
Automobiles	20
Building materials	8
Chemicals	20
Electrical equipment, appliances and supplies	22
Foods	15
Leather	9
Machinery	30
Metal fabricating	14
Office workers	10
Paper, pulp and products	12
Petroleum	15
Public utilities	10
Railroads	20
Rubber	8
Steel	21
Textiles	18

This chart is based on National Industrial Conference Board figures and is published in NICB's series, "Road Maps of Industry."

SCALE MODEL HELPS PLAN MULTI-STORY HANDLING

PROBLEM: To build a three-dimensional scale model of the five-story plant (four floors and full basement) of the American Tissue Mills, Holyoke, Mass.

Since vertical handling was one of the most important problems to be studied with the model, prime consideration had to be given to two factors: (1) Ability to see the elements of adjacent floors in relation to one another; and (2) ease of rearrangement of combinations of floors with emphasis on minimizing the space and manpower necessary for such operations.

SOLUTION: A ¼ inch to the foot model, with the individual floors suspended between supports in much the same manner as the moving span of a vertical lift bridge. Each floor section is individually counterweighted so that one man, standing on either side, can raise or

Floors are made of transparent plastic, and each section operates independently, enabling the viewer to isolate any two or more consecutive floors for detailed study

lower an entire floor with no more than fingertip pressure.

The use of transparent plastic sheets for the floors, plus the independent operation of each section, enables the viewer to isolate any two or more consecutive floors for detail study. The "roof" section provides an ideal dust cover when all floors are in their lowered or "closed" position.

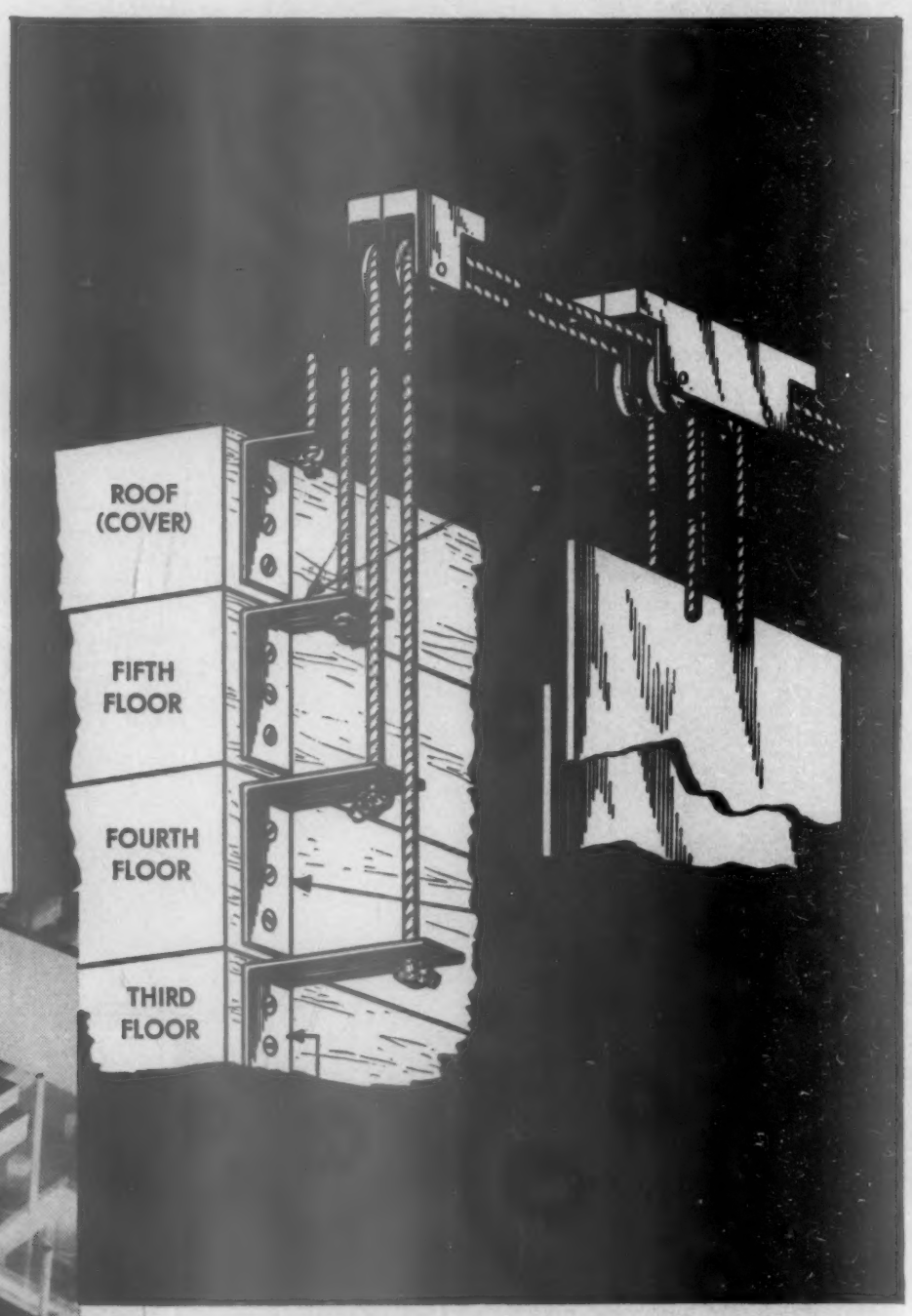
A special problem was presented by the office space, which is housed in an adjoining building of five-story construction with lower ceiling heights. This part of the model is accommodated in the separate cabinet at the right end of the supporting frame. The floors slide in and out on the drawer principle to allow full view.

Two men can "knock down" the model into its components—floors, ends, base, and weights—in about 30 minutes. Reassembly takes little longer.

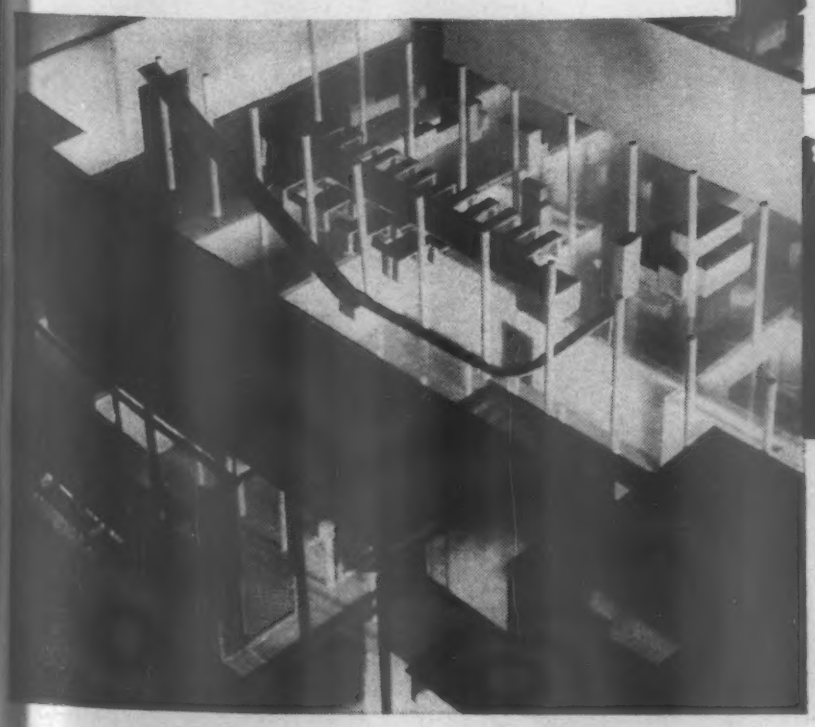
CONSTRUCTION DETAILS: The individual floor sections differ little from those in the more conventional types of three-dimensional scale models, except that each is framed with wood to which handles are attached. To each of the four corners is fastened an angle iron, in the shape of an inverted "L." The horizontal legs of the angle irons are attached to the counterweights by nylon cords which pass through a system of pulleys Successive shortening of the horizontal legs on the higher floors permits all the irons to travel in the same vertical channel, thereby eliminating side-sway, tilting, and slipping.

Models of the machines, conveyors, and interior walls and partitions are made of balsa wood. In building the models, full allowance is made for the travel of any machine parts and for minimum working area. The number of each machine is pasted on the model, and reference to a numerically indexed book makes it possible for the person using the model to see a photograph of the actual piece of equipment. Columns are represented by $\frac{3}{16}$-in. dowels set in holes drilled into the plastic floors.

Completed early in April, this vertical lift-frame model is already proving its worth as a simple, convenient, and efficient tool for rapid reference on the complex problems of layout in the multi-story plant.



Detail of counterweights. Each floor section is individually counterweighted so that one man, standing on either side of the model, can raise or lower an entire floor with a fingertip



Models of machines, conveyors, and interior walls and partitions are made of balsa wood. Columns are $\frac{3}{16}$-in. dowels set in holes drilled into the transparent plastic floors

MORE PREPLANNING LESS METHODS CHANGING

GEORGE R. FAUSTMAN • SUPERVISOR OF STANDARDS DEPARTMENT, BENDIX RADIO DIVISION OF BENDIX AVIATION CORPORATION, BALTIMORE

Cutting and folding thousands of pieces of fishpaper to exact size was a bothersome and costly operation. Machine shown makes it entirely automatic except for feeding start of roll

Ground straps of copper foil can be cut to any length from ½ to 4 inches on this machine, which has increased efficiency of the operation several hundred per cent. Length of the straps is changed by a calibrated dial; pieces are counted automatically

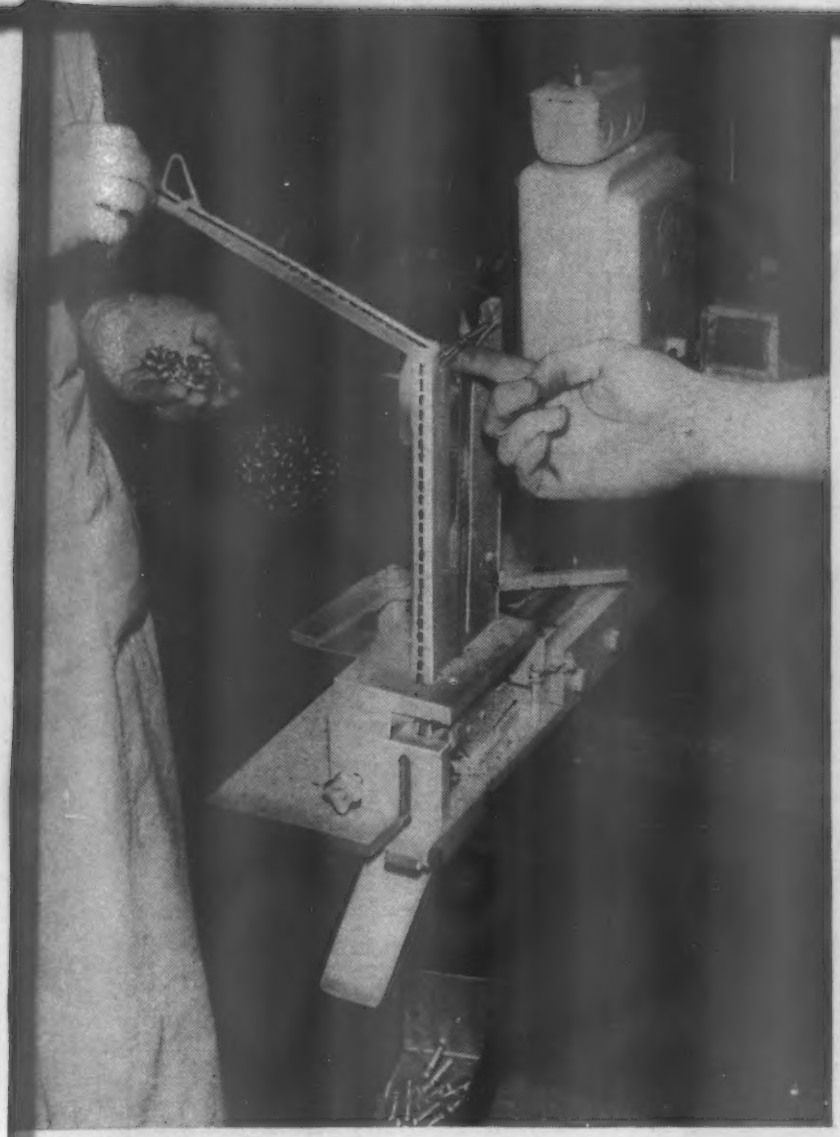
A large share of all methods improvement work at Bendix Radio Division, Baltimore, is done *before* new models actually go into production.

Here are the pre-production steps that are taken to insure that when mass production assembly finally begins, it is at the lowest possible unit cost:

1. The first model from design engineering is submitted to factory engineering. Working with this group, the engineers in the time study and processing department make every possible simplification in the construction of the radio itself, and prescribe the methods to be used in manufacture. Before their work is completed, the "process" men will have a complete assembly line *on paper,* with all operations balanced.

To a great degree their process is tested in the factory engineering laboratory by building approximately ten pre-production models according to plan. These sets must meet all necessary electrical tests and specifications.

2. Methods department engineers then set about designing and build-

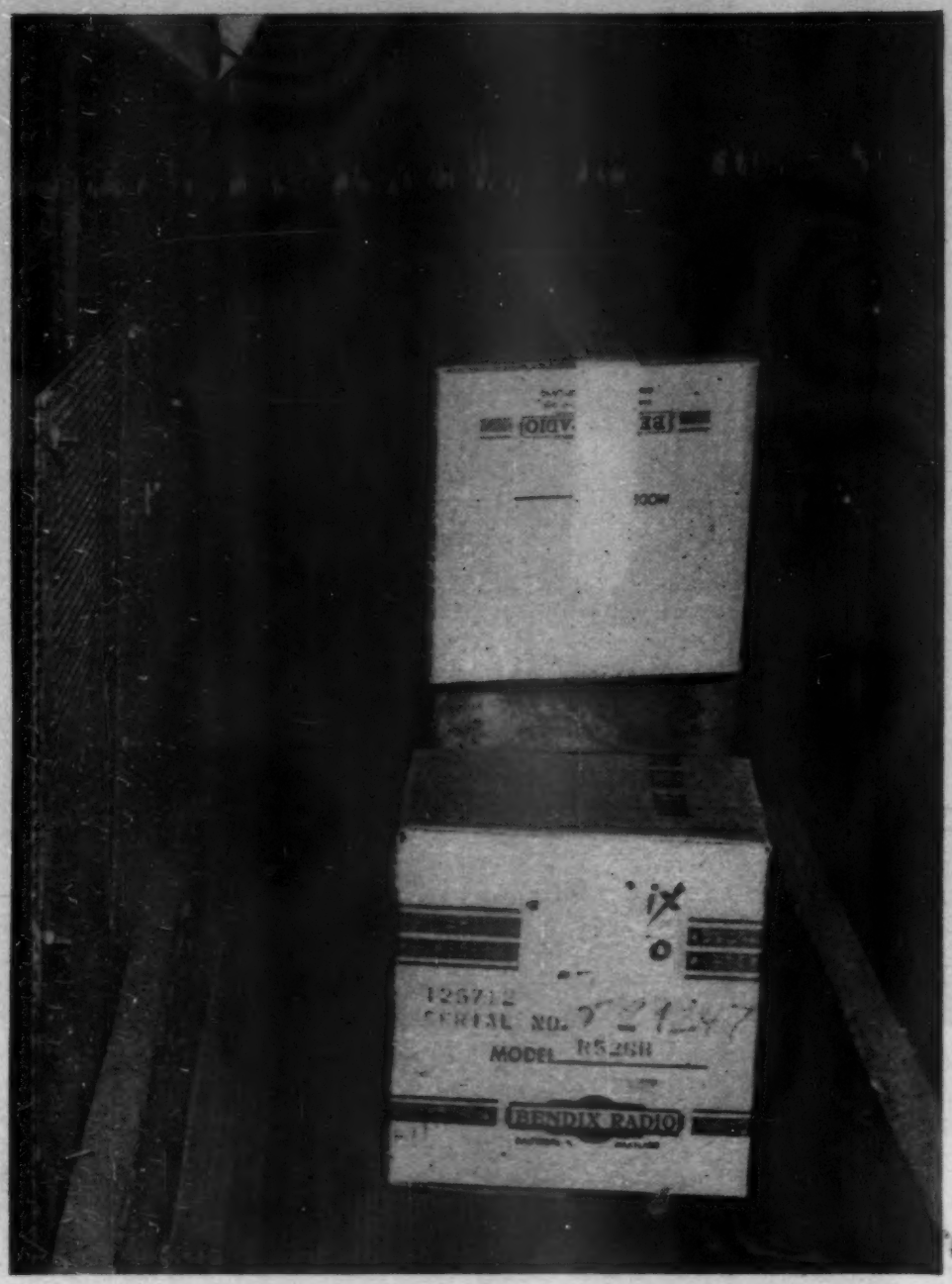


Ramming pulleys onto tuning shafts was once a laborious task; now it is done with a pneumatic ram. Assemblies are made as fast as two operators can feed parts. Misfits are automatically rejected

Wooden dollies on roller bearings are used in the personal aircraft equipment department. Simple and cheap to make, dollies can be discarded or modified if made obsolete by design changes

Photo-cells are doing many jobs on Bendix assembly lines. As the cabinet is picked off the conveyor in order to insert the radio, this light permits the belt to move the next cabinet into position

To eliminate tangling, dial cords are now made in one continuous length. Special stapling machine puts loops in the cord at proper intervals; at assembly station, cord is cut by pre-positioned knife



To prevent pile-ups, counterweighted gates at each junction permit only one carton at a time to move along conveyor to shipping room. How the gate operates to prevent mishaps is shown above. Below, home radios, fully packaged, come off assembly lines and are placed on a transverse overhead conveyor by vertical lifts

ing any special machinery, equipment, and fixtures which are necessary in order to perform the required operations.

Any further possible simplifications in the *methods* of performing the work are made, although this group does not directly concentrate on changes in the design itself. However, if such changes appear desirable, they are called to the attention of the "process" men, and are usually incorporated. A close liaison is maintained between these two groups, so that when the methods engineers have completed their work, the future "line" will still be balanced. The final project of this section is to plan the complete physical layout of the production assembly area.

Vitally important test equipment is designed and constructed by the test and inspection department, due thought being given to the assembly line layout and the time balance.

3. The assembly line is now set up by the methods department for a "pilot" production run. From 50 to 200 complete models are turned out on this line and all operations are closely observed for "bugs," or for easier and quicker ways of performing operations, which might have been missed while the project was still on paper.

When all the responsible groups are satisfied with the operation of the pilot line and the models have passed all the necessary tests, regular production begins.

An engineer is detailed to keep close watch on the new line for some time, and to suggest possible improvements. Even after this initial period, all operations are reexamined from time to time. But experience has shown us that a high percentage of all "improvements" are made before a new model ever reaches the production line.

The accompanying illustrations show some of the most readily photographed methods improvement projects. The biggest savings, however, result from more intangible improvements — improvements against which there is no firm basis of comparison because the old method was engineered out of existence while still in the laboratory.

HOW PLANT-FITNESS INSPECTIONS ARE MADE AND FOLLOWED UP

HARRY L. HUSSON • SUPERINTENDENT OF WORKS SERVICE, WESTERN ELECTRIC COMPANY, INC., KEARNY, N. J.

In May FACTORY the author described the organizational relationship of the special plant inspection staff, and the nature and frequencies of the 50 kinds of inspections it makes to cover the operations and subsidiary services of this large plant. Here he tells how inspections are made, recorded, and followed up

The task of making the 50 types of plant inspections at the Kearny Works of Western Electric Company is divided among the twelve staff inspectors, each of whom is assigned tours of duty in the fields that most closely parallel his training and experience. However, considerable flexibility of operation, even with the limited number of men on the staff, is gained by the fact that all the inspectors have experience backgrounds which permit interchanging their tours of duty whenever necessary.

In conducting inspection surveys, the general routine in all cases is basically the same. Before starting a survey, each inspector briefly reviews the reports of the identical inspection immediately preceding, and checks the codes, rules, and requirements affecting or controlling the operations or equipment which will come under his scrutiny.

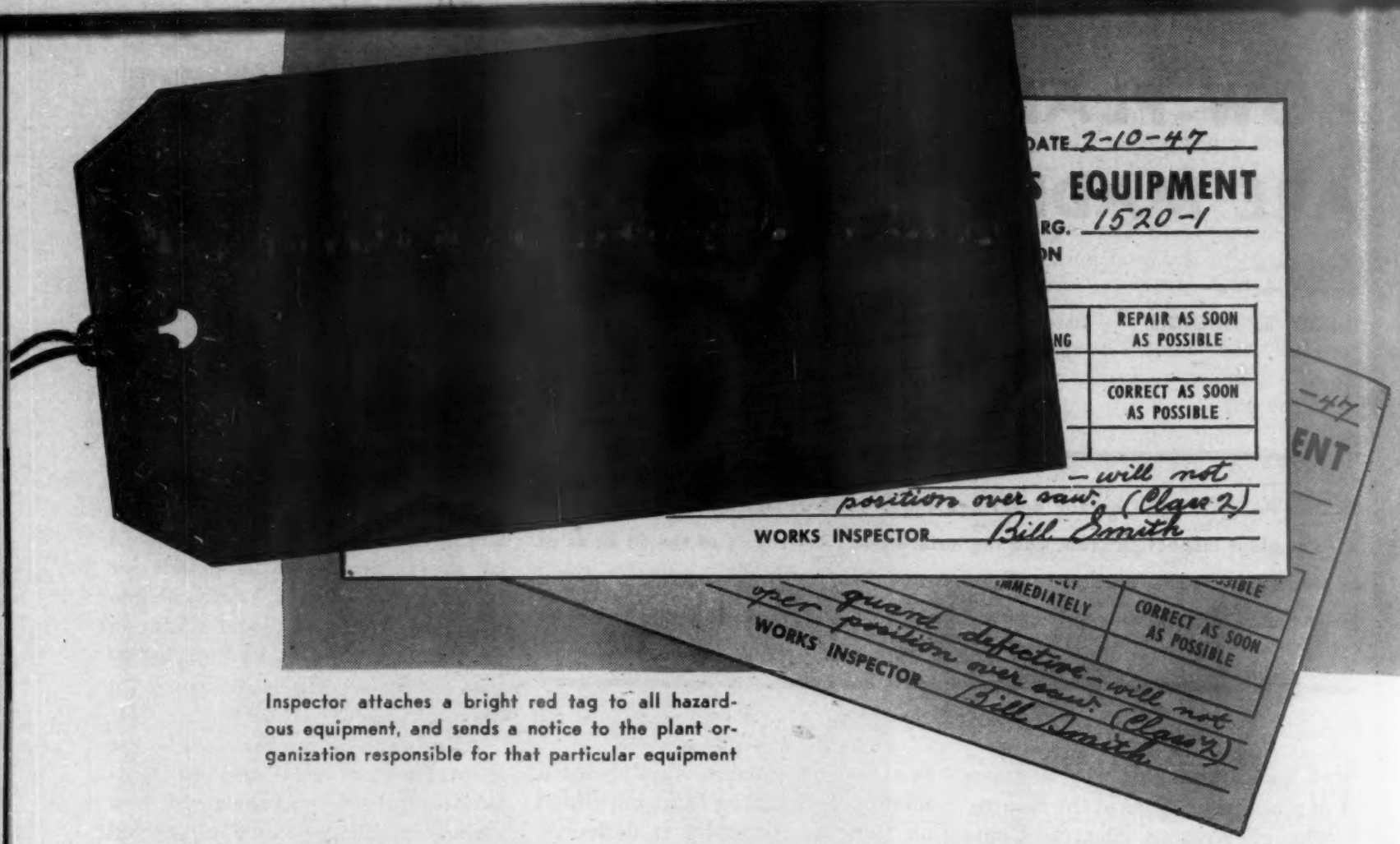
While working in the field, the inspector points out verbally any irregularities to each departmental supervisor concerned. In addition, he tags each piece of equipment which is in hazardous or defective condition. Provided with each tag are two removable slips printed identically with the form imprinted on the tag. One slip is delivered immediately to the organization responsible for the equipment; the other slip is retained by the inspector for his subsequent report and follow-up. The tag attached to the equipment is returned to the inspector only after corrective measures have been taken.

Upon completion of his tour of duty, the inspector forwards individual written notices of all irregularities both to the supervisors in the departments in which the violations occur and to the service and maintenance supervisors responsible for correcting the violations. Copies of these notices are retained by the inspection organization for follow-up in case any original notification is not returned within a limited time, which would signify that corrective measures have *not* been taken.

After distributing his notices, the inspector consolidates his information into a general report which is stencil duplicated and circulated among the organizations surveyed, the Works service organization, and the engineer of plant.

Items or irregularities on all reports are classified according to the relative urgency of correction. Class 1 items require immediate correction and usually involve the suspension of the operation or equipment until corrective steps have been taken. Class 2 items are only slightly less serious than Class 1, and corrections should be made as

Every precaution is taken to assure the safety and protection of personnel. Before permitting a workman to descend into an underground tank, inspector supervises exhausting the fumes, and takes an atmosphere reading for explosive or toxic gases



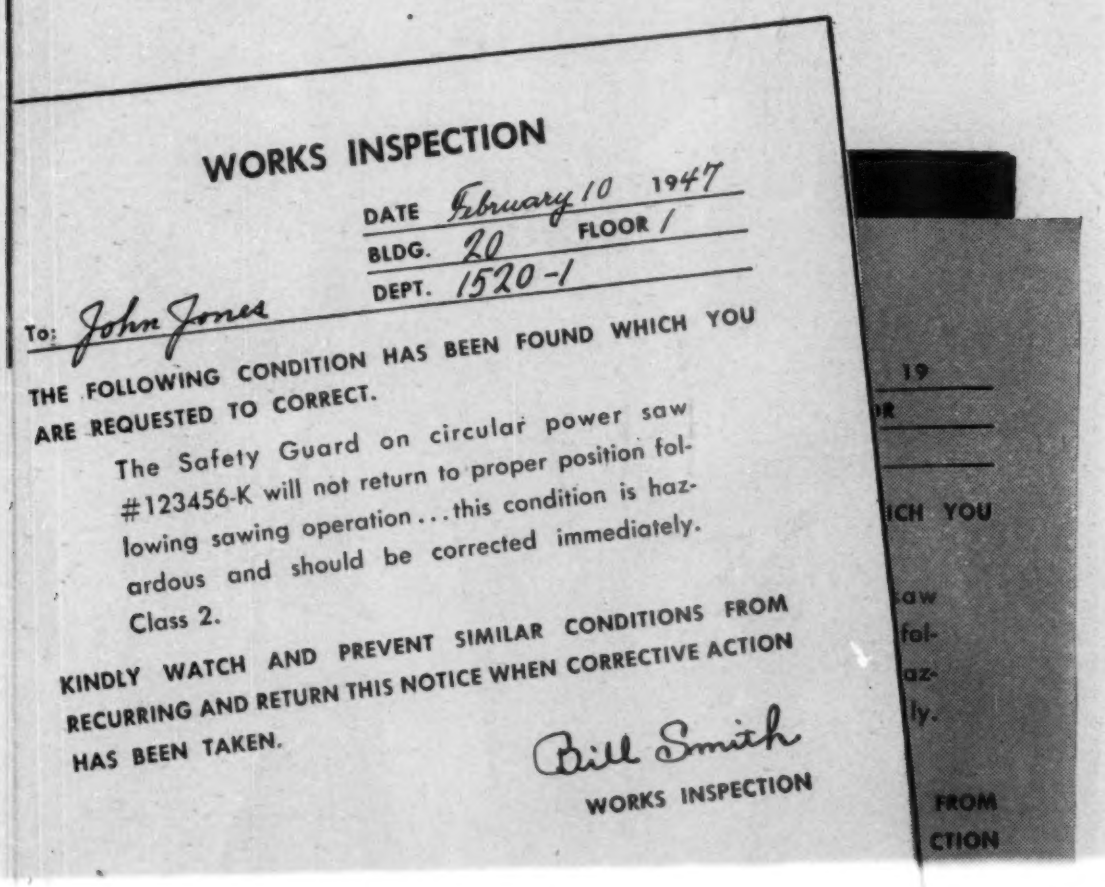
Inspector attaches a bright red tag to all hazardous equipment, and sends a notice to the plant organization responsible for that particular equipment

soon as possible to avoid reclassification into the Class 1 bracket. Classes 3 and 4 involve minor irregularities which, while not requiring immediate attention, should be corrected when the operation or equipment is normally idle and man-power permits executing the recommended changes.

Each inspector is authorized to suspend operations or equipment if in his judgment and according to his translation of the governing codes, rules, and requirements, the operations or equipment are sufficiently defective or hazardous as to constitute an imminent danger to personnel or property. Naturally, differences of opinion may arise in such cases. Most frequently, these differences are settled on the spot by the inspector and the operating or service supervisors by joint reference to the codes, rules, or requirements covering the operation or equipment in question. However, should there fail to be an agreement between the inspector and the supervisor, the latter may appeal for a ruling from the chief inspector of plant. Nevertheless, until a final ruling has been obtained the operation or equipment is forced to remain inoperative.

The importance attached to plant fire protection in the inspection program is indicated by the fact that two of the twelve inspectors devote their full time to a continuous check of fire-protective equipment. Twelve of the 50 inspection surveys involve this type of equipment and, in addition, the watchmen's daily reports and the day-to-day observations of the entire staff supplement the formal inspections.

In recent months the plant protection department—guards and watchmen—have been provided with small yellow "Violation" string tags for use on their daily tours of duty. These tags are attached to equipment obstructing a clear path to the location of fire-protective equipment, or attached to the latter equipment if it appears to be defective in any way, or to materials blocking aisles and thoroughfares. The locations of the tags


WORKS INSPECTION
DATE February 10 1947
BLDG. 20 FLOOR 1
DEPT. 1520-1
To: John Jones
THE FOLLOWING CONDITION HAS BEEN FOUND WHICH YOU ARE REQUESTED TO CORRECT.
The Safety Guard on circular power saw #123456-K will not return to proper position following sawing operation ... this condition is hazardous and should be corrected immediately.
Class 2.
KINDLY WATCH AND PREVENT SIMILAR CONDITIONS FROM RECURRING AND RETURN THIS NOTICE WHEN CORRECTIVE ACTION HAS BEEN TAKEN.
Bill Smith
WORKS INSPECTION

Inspectors fill out individual written notices of deficiencies and irregularities on completion of their surveys. Notices go to supervisors of departments in which the violations have occurred, and to the supervisor responsible for their repair or correction

are reported in the watchmen's daily reports. Inspectors promptly investigate all violations, major and minor, and remove the "violation" tags after necessary corrective measures have been taken.

Whenever a fire alarm is sounded, an inspector is immediately assigned to the scene of the fire to make a full investigation. The results of his survey are contained in a formal fire report which, in addition to the customary information as to date, time, and location of fire, gives a detailed description of what occurred, amount of damage, and injuries to employees. It also describes steps taken in the inspector's investigation as to the cause of the fire, and presents his recommendations for preventing recurrences.

All sprinkler system shutdowns are controlled by the inspection organization to prevent unauthorized operation of sprinkler valves. When contemplated structural changes require a shutdown, an inspector investigates the request to determine whether or not such a shutdown would create an undue fire hazard because of the occupancy. If the fire hazard is great, the shutdown is delayed until shop operations are suspended.

The plant inspection organization also issues all welding and burning permits. An inspector is assigned to investigate the proposed location of the burning or welding operation. He surveys the potential fire hazards in the vicinity, and grants a permit with certain stipulations and requirements designed to minimize the hazards. The permit includes special instructions to be observed by the welder and is signed by the welder, his helper (who also acts as fireman), the welder's immediate supervisor, and the issuing inspector. The plant fire department is also notified of each

After consolidating information on a particular inspection survey, the inspector fills out a general report form for circulation among interested organizations and the upper levels of management

WORKS INSPECTION OF HOUSE WATER AND SPRINKLER TANKS

SUMMARY

CURRENT REPORT ITEMS			PREVIOUS REPORT ITEMS		
ORG.	NEW	OLD	TOTAL	CORRECTED	NOT CORRECTED	TOTAL
2940	3	0	3	3	0	3

ITEM No.	BUILDING LOCATION	DESCRIPTION	CONDITION	ACTION
1	30-8	S.E. Sprinkler Tank	Very good	
2	30-8	N.E. Sprinkler Tank	Very good	
3	30-8	S.W. House Tank	Fair. The few rust spots showing did not warrant painting tank. Class A.	2940-3
			The low water alarm float rod was broken at the coupling. Repairs to rod were made same day the tank was inspected.	
9	71-9	South Sprinkler Tank	Very good	
10	71-9	North Sprinkler Tank	Very good	

APPROVED BY: _____ SUPT. OF WORKS SERVICE

INSPECTOR: C. R. LANDBACK — 2907-2

COPY TO: ENGINEER OF PLANT — 195 BROADWAY
2900 2901 2940 6000 6001

PLANT AND INSTALLATION INSPECTION DEPARTMENT 2907

PERMIT FOR
WELDING, BURNING OR CUTTING, OR USE OF SCAFFOLD

___ARC ✓ GAS ✓ BURNING OR CUTTING ___ USE OF SCAFFOLDS OVER 6 FEET HIGH

LOCATION Bldg. A-2-N DEPT. 718 ORDER No. X-794382

VALID FROM 1-15-47 8:30 A.M. P.M. TO 1-15-47 3:00 A.M. P.M.

JOB DESCRIPTION: Burn out section of steel bench

CHECK REQUIREMENTS OF THIS JOB:

1. ___ CO_2
   ✓ CCl_4
   ___ FOAM UNIT
   ___ WET RAG
   ___ WATER PAIL
   ___ SAND PAIL
2. ✓ PROVIDE MAN TO STAND WATCH
3. ✓ MAKE SURE SPRINKLERS ARE IN SERVICE AND HEADS ARE PROTECTED
4. ✓ BEFORE STARTING, SWEEP FLOORS CLEAN AND WET DOWN WOODEN FLOORS
5. ✓ CLOSE ALL OPENINGS THROUGH WHICH SPARKS MIGHT ENTER, SUCH AS WINDOWS, DOORS, OPENINGS IN FLOORS
6. ✓ MOVE COMBUSTIBLE MATERIAL 20 FEET AWAY
7. ✓ COVER MATERIAL WITH Asbestos blanket (FLAMEPROOF MAT.)
8. ✓ DO NOT USE EQUIPMENT WITHIN 50 FEET OF FLAMMABLE LIQUIDS
9. ___ CLEAN ___ THOROUGHLY (EXHAUSTS, MACHINES, CONTAINERS)
10. ___ PROVIDE LOCAL VENTILATION
11. ✓ ENCLOSE WELDING AREA
12. ___ TEST FOR EXPLOSIVE MIXTURE WITH GAS DETECTOR
13. ___ NO CUTTING OR WELDING TO BE DONE ON SEWER LINES OR THEIR VENTS
14. ___ SHIELD ARC OR FLAME WITH SCREEN DISPLAYING SIGN, "DO NOT WATCH ARC OR FLAME"
15. ✓ PROVIDE WATER PAN AS SPARK CATCHER
16. ✓ WATCH AREA FOR 30 MIN. AFTER JOB IS COMPLETED

REMARKS: No trucking during operations

JOB COMPLETED 1-15-47 2:50 A.M. P.M.

SIGNED John Brown WELDER B C. Jones SUPERVISOR

J Smith FIREMAN G. A. Green INSPECTOR

All requests to perform welding or burning operations in the plant are checked by the inspection organization. Restrictions are laid down to minimize fire hazards, and the fire department is alerted

permit issued so that it will be alerted to the operation. This same form is used for approval of temporary scaffolds over 6 feet high to make certain they do not obstruct fire-protective equipment.

Particular attention is paid to the locations throughout the plant where spraying operations, use of materials having toxic fumes, and use of flammable materials constitute an undue health hazard. Inspections of exhaust and ventilating systems (including atmospheric checks), containers, storage areas, and labels are frequent.

Repairs and alterations to underground tanks are made under the direction of the inspection organization. Examinations of these containers are made at frequent intervals with special precautions being taken before descent is made into the tanks by inspectors or repair crews. The atmosphere in the tanks is exhausted by portable exhaust equipment in all cases and atmospheric tests are made before anyone is allowed to enter the tanks. In changing the liquid contents of any tank, an inspector makes a visual and hammer test of the tank's interior in addition to making a careful check of all pipes and associated equipment.

Members of the inspection staff at Kearny have been carefully selected from the ranks of the various trades in the plant—millwrights, electricians, steamfitters, mechanics, etc. They are men who have proved their ability in their particular fields and have acquired a knowledge of associated trades over a period of years. Several inspectors are technical-college graduates and have supplemented their college education with several years' experience in plant engineering work or in the various trades.

Capable Responsible Men

Inspectors are chosen for their ability to accept responsibility and to discharge it with relatively little supervision. They are also chosen for their ability to meet higher levels of supervision and talk intelligently and with authority on the inspection reports for which they are responsible. They must be able to write clear, concise reports, and must have a personality that elicits cooperation from those whose functions they are required to check.

It is virtually impossible to appraise in actual dollars and cents the value of any plant inspection program of this kind, because there are too many factors contributing to a low rate of loss in all of the fields which come under the scrutiny of the inspection staff. It is reasonable to state, however, that this inspection organization has contributed a large share to a record which places the insured losses at Kearny Works 40 per cent under the national average for all plants in its class. There is no way, obviously, to estimate the injuries or losses which *might* have occurred both to personnel and to property, if this type of inspection had not been such a vital part of the plant's over-all policy and program.

NEW SYSTEM CUTS PRODUCTION CONTROL COSTS 35 PER CENT

RICHARD J. FINNEGAN • DIRECTOR OF SYSTEMS AND PROCEDURES, THE WEATHERHEAD COMPANY, CLEVELAND

Simplicity and flexibility are the main features of the new production control program at The Weatherhead Company. Made necessary by the tremendous increase in volume over pre-war operations, and the expansion of the normal line of 40,000 small machined parts (including many assemblies with component parts numbering from 3 to 75), this new plan is expected to reduce that part of the overhead directly attributable to production control activities from 0.133 to 0.086 cent per dollar of manufacturing expense, or approximately 35 per cent.

Advantages

The principal advantages of this new system are that it:

1. Permits determination of accurate delivery dates by reference to machine load charts and material records.

2. Relieves highly trained production control personnel of the performance of purely routine or clerical functions, and enables their concentration on the solution of perplexing shop problems with which they are familiar.

3. Furnishes accurate and up-to-date instructions as to the availability of the proper tools and raw materials.

4. Permits accurate and prompt decisions as to whether special parts, which have not passed inspection, should be salvaged or scrapped.

5. Allows factory production departments to operate on a predetermined schedule that coordinates the orderly flow of work between primary and secondary operations departments.

6. Places the control and responsibility for performance and schedule of orders released to the shops in the hands of the foremen.

7. Permits foremen to reduce set-up costs by scheduling orders in a sequence that requires only minor set-up changes.

8. Reduces the total number of shop orders by combining sales orders for the same part.

9. Assures production departments of receipt of the latest available drawings, routings, and standard incentive rates.

Responsibility for the success of the new control plan has been centered in a reorganized production control department, which is divided into four sections to permit an orderly flow of work within the department. These sections are:

Inventory control section. Receives sales orders that have been typed from customers' purchase orders and determines whether the orders can be filled from available finished parts or whether the parts have to be manufactured. Standard parts are ordered from the production planning center according to predetermined estimates of the next 90 days' requirements. Raw materials and parts that must be purchased from other firms are ordered upon receipt of instructions from the production planning center.

Production records section. Maintains master part folders that contain the master routing, master tool sheet, part blueprints, and preliminary tool sheet for each part manufactured. The section also takes care of the typing of shop order masters and reproduction of the master routing and tool sheets and maintenance of files.

Production planning center. Has the sole responsibility for maintaining a proper balance of production

Behind schedule report gets preferred treatment. If order cannot be returned to schedule by expediting, other departments on the routing are notified of the necessary changes

BEHIND SCHEDULE REPORT

TO: PRODUCTION FOLLOW-UP — FROM: MACHINE GROUP 0240

DEPT. NO. 135	PROD. ORD. NO. 1F67380	PART NO. 103-32554
SCHED. START DATE 2-4-46	REPORT DATE 2-5-47	NEW START DATE

CHK.	REASON	REMARKS
✓	NO TOOLS OR GAGES	New #103-32554 Form
	NO MATERIAL	tool ordered 2-4-46
	INCORRECT ROUTING	J Wargo
	MACHINE OVERLOADED	
	PREV. DEPT. BEHIND SCH.	
	ENGINEERING CHANGE	
	MACH. BKDN. No.	
	OTHER	

in the shop, for making definite delivery promises for transmission to the customer, and for balancing the work between branch plants.

Production follow-up section. Assists the production planning center by following up shop orders to assure completion according to planned schedule and by posting production and closing out orders.

Heart of the control system is the production planning center. It is made up of a small group of carefully selected individuals, each a specialist in his own field. The positions in this group are:

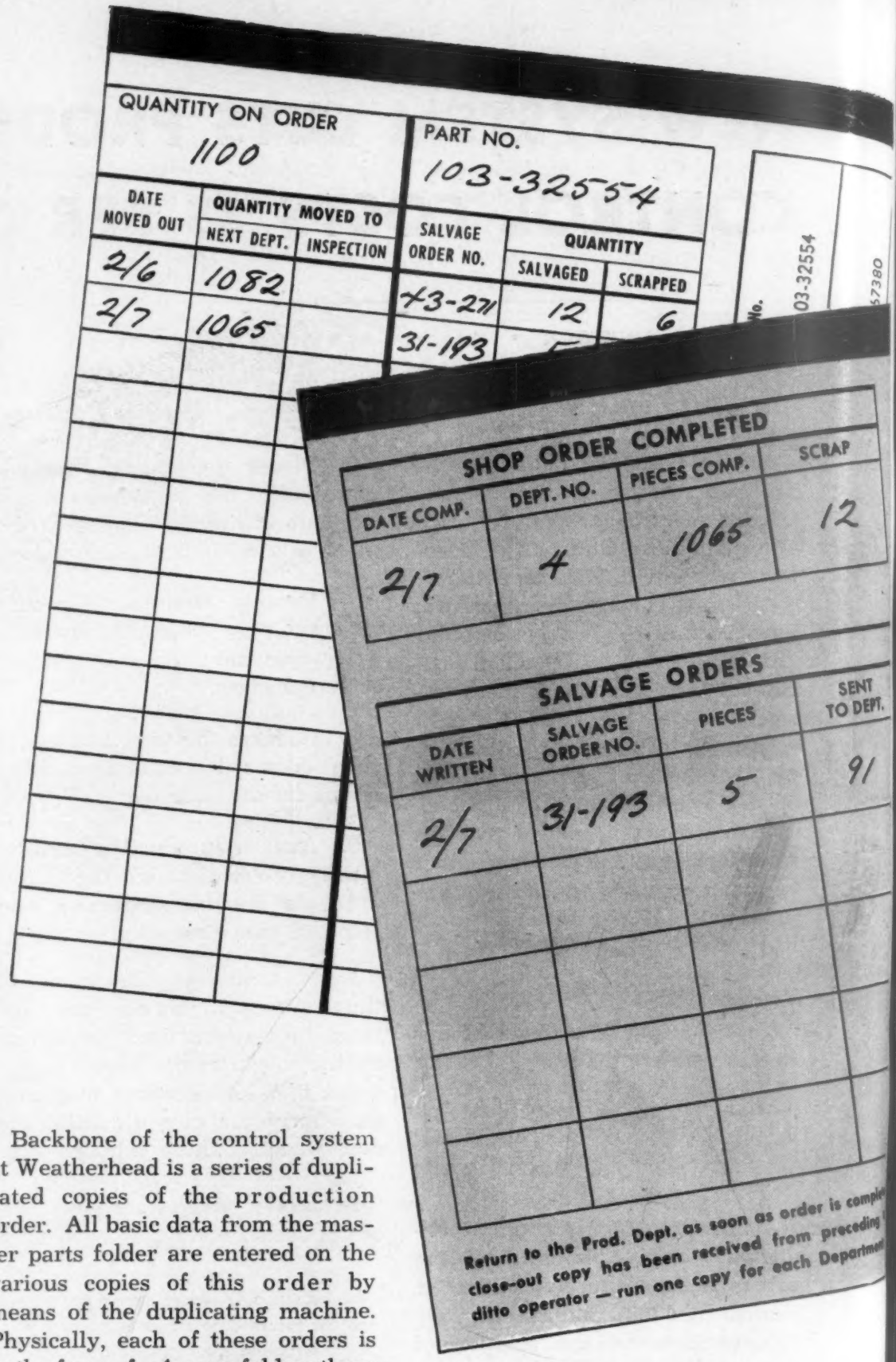
1. *Machine loader.* Checks all incoming orders and calculates number of machine hours that orders will require. Enters as black line on machine group load chart the cumulative hours required for all new orders. When orders are released to the shop, extends red line for each machine group affected. This indicates the total load against each machine group, or orders released to the shop. As orders are returned completed, blocks in the hours actually required for the order. From this record he can always advise which machine groups have the heaviest backlog of work.

2. *Material man.* Receives copies of daily "inventory on hand" in the various storerooms, and of the "material-in" reports, which indicate the arrival of new material. Also keeps tabs on material shortages that will affect delivery promises and release of orders to the shop.

3. *Tool man.* Checks on and follows up the manufacture of production tools. If production of required tools cannot be speeded up to allow release of order to the shop, informs planners and schedulers in time for release of substitute orders.

4. *Branch plant coordinator.* Handles all work intended for production in the three branch plants. By his knowledge of the load against each plant can either help out or request aid from the main plant.

5. *Planners and schedulers.* Plan and schedule all orders on the basis of the other information furnished by members of the center.



Backbone of the control system at Weatherhead is a series of duplicated copies of the production order. All basic data from the master parts folder are entered on the various copies of this order by means of the duplicating machine. Physically, each of these orders is in the form of a 4-page folder; three pages are taken up with the duplicated material. The fourth page differs on each form, and provides spaces for filling in the information pertinent to the department to which it is issued.

Within the production departments, control rests primarily on three copies—the parts copy (green), departmental file copy (gray), and the close-out copy (white). The green and gray copies are sent to the departments performing operations (one set to each such department) well in advance of the actual date on which work is to begin. The gray copy is filed according to the date on which the department is scheduled to begin work; it thus becomes a tickler to insure adherence to schedule.

To illustrate the steps taken in the shop to maintain control with these forms, here is the sequence of moves involved in a hypothetical case:

1. When Department 135 finishes its works on the order covered by the forms shown, the foreman fills out the close-out, or white, copy, and sends it to Department 4, which is to perform the next operation.

2 Receipt of the close-out copy signals to Department 4 that the work is about to be delivered to it.

The file copy and parts copy are then withdrawn from the file, and the work is immediately scheduled within the department to meet the assigned completion date. The release of the green copy to the machine is the signal to start the work.

3. As the work progresses, a record is made on the back of the parts copy showing any pieces that have been declared substandard. Simultaneously, all work performed is entered on the file copy, to make a permanent record for costing and accounting purposes.

4. When the job is completed, the foreman sends the parts copy back to the production control center as a signal. At the same time, the close-out copy entries are made—summaries of the information on the other forms—and the copy is forwarded to Department 222. All forms not forwarded to other departments, and all blueprints and routing and tool sheets are destroyed. This prevents any possible duplication of production on the order—or later production to a set of obsolete prints. With this fourth step the cycle is completed and ready to begin again in the next department.

What happens when a department fails to meet the schedule? To take care of this contingency, a "behind schedule report" is available for the foreman's use. When it becomes evident to the foreman that he cannot meet his schedule, he fills out one of these reports, showing the reason for the delay, and sends it to the production follow-up department. Every effort is then made to bring the order back on schedule. If this proves impossible, the order is rescheduled and all succeeding departments on the routing are advised of the change.

These three forms provide primary control of all orders in the shop. When order is completed, green copy is returned to control center, white copy forwarded to next department on routing. Actual sequence of operations in the shop is planned by the foreman to minimize set-ups as well as to meet schedules

PRODUCTION ORDER CLOSE-OUT COPY

PRODUCTION ORDER PARTS

PART No.	ORDER No.	QUANTITY	SALES ORDER No.
103-32554	IF 67380	1100	A152807

PART NAME	DATE ORDER REL.	COST CONTROL No.
Pipe Nipple	Jan. 28. 1947	

TYPE OF ORDER	TOOLS
INDUSTRIAL	OK

MATERIAL	QUANTITY	PROMISE
416 Stainless Steel	125 lbs.	

SIZE 9/16 Hex.

...d and the ...epartment ...on routing

RECEIPTS

ORDER CLOSED BY PRECEDING DEPT. FOR TOTAL OF 1082 PCS.

WORK IN PROCESS OPERATIONS

CHANGE OR O.S. NO.	132512				
RATE	1.13				
OPERATION NO.	202				
OPERATION DESCRIPTION	Remove burr				HOURS RUN
DP 1810					

SALVAGE ORDER NO.	QUANTITY	TO DEPT.	SALVAGE ORDER NO.	QUANTITY	TO DEPT.	SCRAP
31-193	5	91				12

MATERIAL	PART NAME	PART No.
416 Stainless Steel	Pipe Nipple	103-32554

SIZE	QUANTITY	TYPE OF ORDER	DATE ORDER REL.	ORDER No.
9/16 Hex.	125 lbs.	INDUSTRIAL	Jan. 28. 1947	IF 67380

CODE	PROMISE	TOOLS	COST CONTROL No.	QUANTITY
132527	OK	OK		1100

DESCRIPTION OF PART

SPECIAL SPECIFICATIONS

SALES ORDER No. A152807

PRODUCTION ORDER DEPARTMENTAL FILE COPY

DEPARTMENT	135	4	222	230			
DATE	2/4	2/6	2/8				
COMP. DATE	2/5	2/7	2/8	2/11			

CUSTOMER SPECIFICATIONS TELETYPED TO ASSEMBLY

H. J. BUSTETTER
SUPERVISOR OF SCHEDULING
IN PRODUCTION PLANNING
KAISER-FRAZER CORPORATION
WILLOW RUN, MICH.

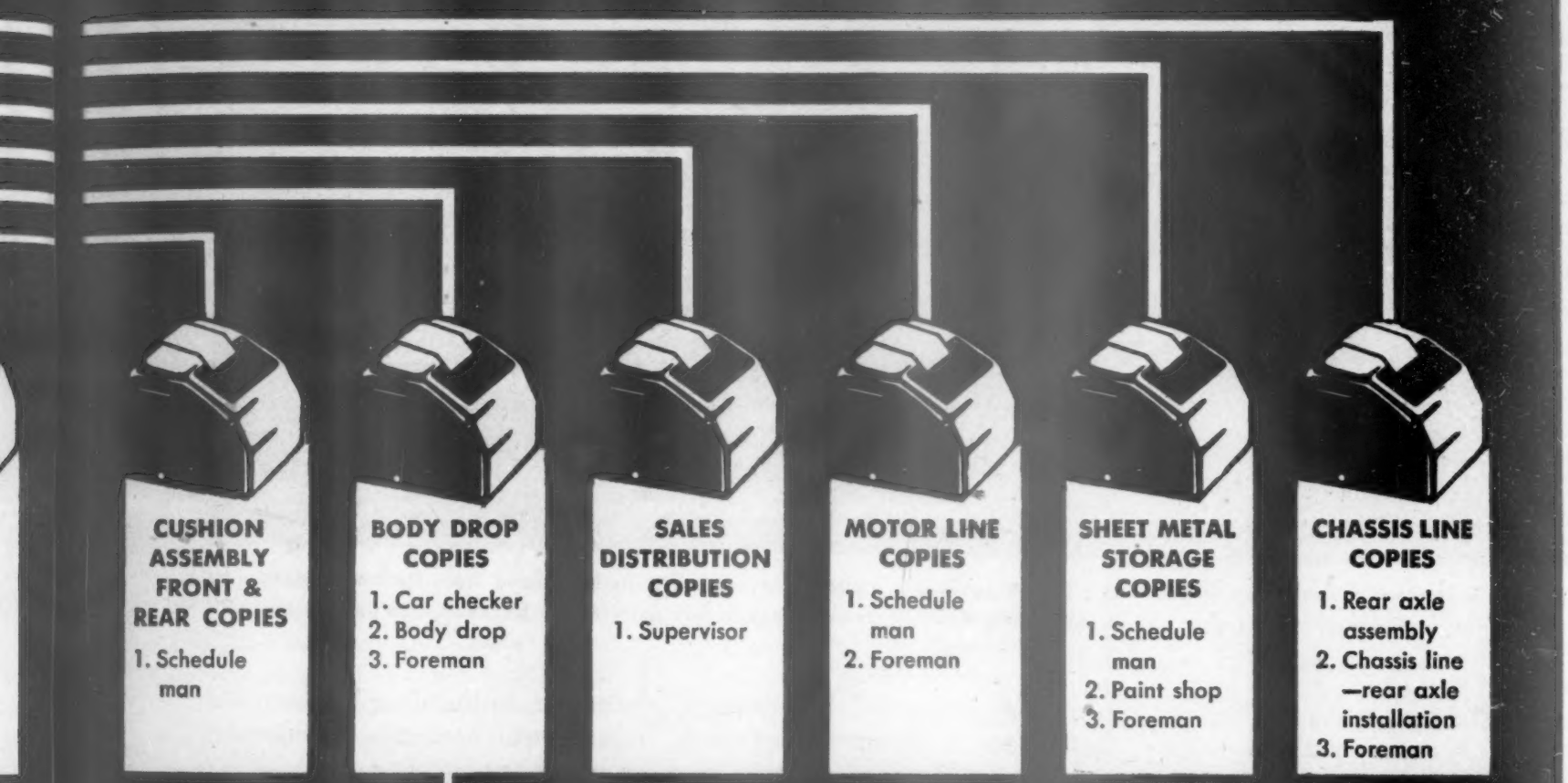
Latest schedule information is transmitted from the teletype sending station (above, left) to all key production points, designated by the teletype receivers in the diagram. This system eliminates possible confusion or mix-ups in building cars to meet every detail of the customers' specifications. The scene in the body drop department (right, below) shows how a quick glance at the track sheet on the teletype receiver simplifies mass production of "custom-built" automobiles. This scene is repeated in ten departments

Rapid communication is the key to production planning, scheduling, and control at Kaiser-Frazer. A minimum of paperwork is combined with 26 telautograph units and 2 sending and 10 receiving tele type machines, as shown in the accompanying diagram.

Although automobiles are mass produced on a conventional assembly line, the system allows each car, in effect, to be "custom-built" by transmitting information rapidly and simultaneously to all key production points in the plant. From the moment the sales order arrives and the materials are received, advance information is broadcast to all main production points so that each operation on the many lines is ready with production details regarding body type, style, make, trim, instruments, accessories, and other details as requested by the customer.

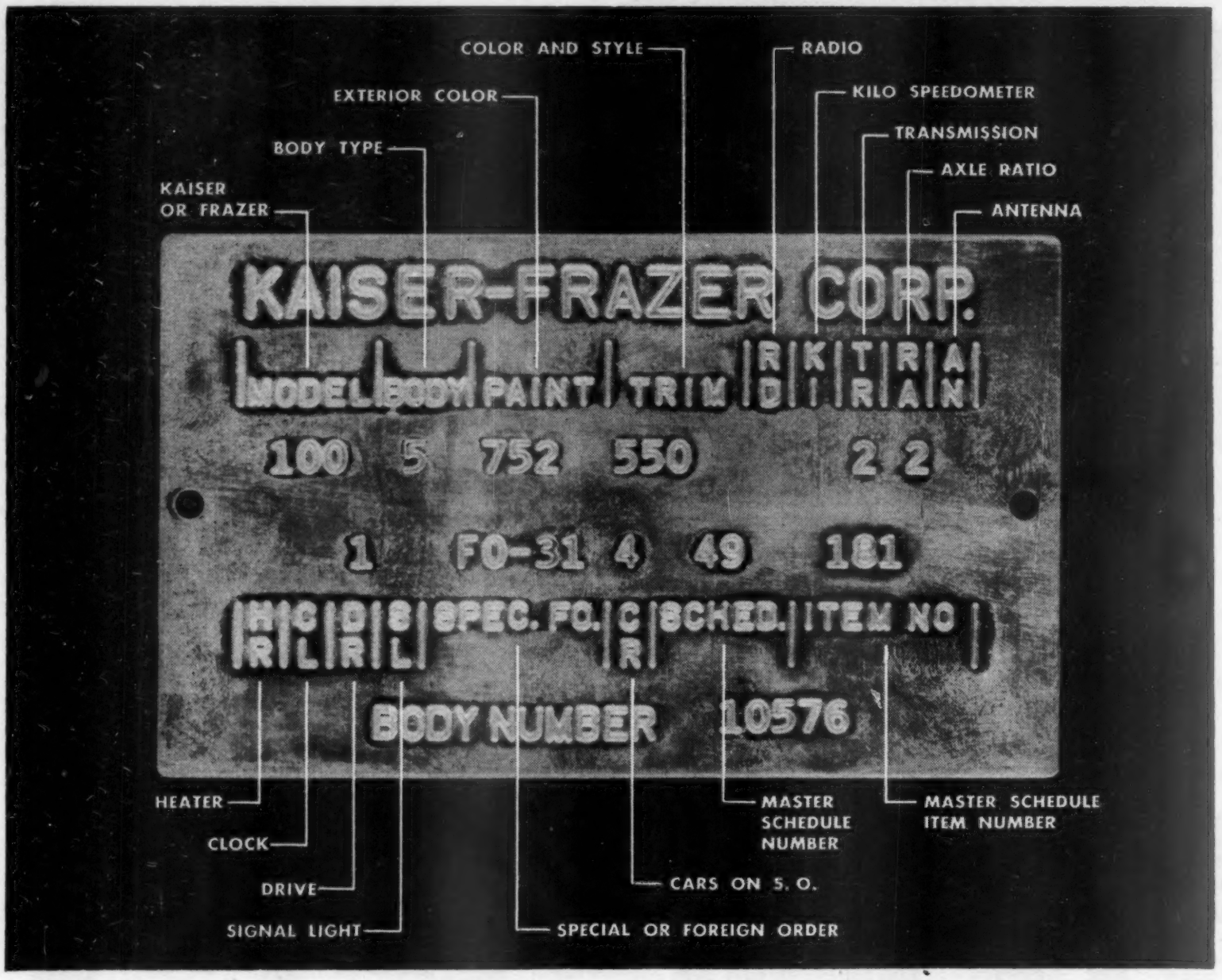
Nerve center of the communications system is the main teletype sending station in the production scheduling department. From this station more than 12 miles of communication wire, 3 miles of conduit pipes, and 5500 feet of protective cable span out to key points on the 10,000-odd feet of assembly lines throughout the plant.

When an order is received from a dealer, it is immediately forwarded to the sales distribution department, which prepares an official factory sales order giving all the pertinent facts. From this order, a *master framing schedule* is prepared. In building this schedule, consideration is, of course, given to such factors as time required to receive raw materials, time to perform the successive operations, and plant capacity. When finally drawn, copies of this schedule are issued, several days before actual building is to



begin, to the following departments to enable them to plan for the production scheduled: Follow-up, sales, rough body line, sheet metal, material control, inspection, trim, traffic, costs, and the master teletype station. When the teletype broadcasts this information on the actual day of building, the master framing schedule becomes the *car building schedule.*

All essential assembly and production data on the framing schedule are coded and stamped on a metal plate, which is attached to the body at the dash line shortly after



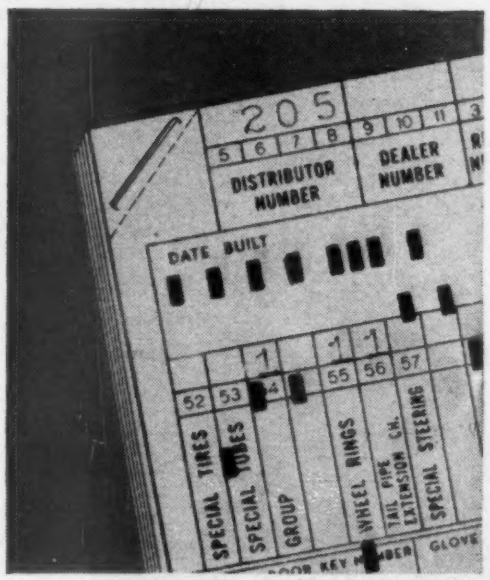
Code plate is attached to body soon after assembly begins, carries all information necessary to insure production to customer specifications. Information is flashed ahead from station to station by telautograph so that materials will be ready when needed

assembly begins. As the body moves down the line, information is taken from the plate and telautographed ahead to the next station, thus insuring that whatever special materials are required for the particular body will be ready and waiting.

Cards Carry All Data

A further aid to rapid and accurate production-to-specifications is provided by a group of eleven identically punched cards. Each of these cards carries a full summary of the information on the sales order for a particular car.

The first five of these cards precede the car to the following points on the assembly line: (1) Body to underbody department, to start correct make and model of car in rough; (2) coding room, to get proper code plate attached to the body; (3) rough body department, to prepare proper finish; (4) paint department, to insure proper color and exterior trim; and (5) trim department, to install upholstery and interior trim according to customer specifications.



Eleven identically punched cards provide advance information to assembly departments. Five accompany car through final assembly, are used by inspectors as flags for planning, billing, and shipping departments

The remaining six cards are stapled together and delivered to the body drop department. When the body is dropped, card number 6 is pulled, and the balance of the cards are placed in the glove compartment of the car. As final assembly proceeds, key numbers and body and motor numbers are entered on these cards. The checkers and inspectors at the appropriate stations pull these cards and send them as flags to the planning, billing, and shipping departments.

The use of these cards, coupled with teletype broadcasts of the sequence in which jobs will travel the final assembly line, enables the car to roll into final inspection with the billing prepared, the serial numbers entered, all production reports in, and the shipping order ready.

CODED COLORS SHOW WHICH POWER OUTLETS TO USE

JAMES H. DUNCAN • PLANT ENGINEERING SECTION, RCA VICTOR DIVISION
THE RADIO CORPORATION OF AMERICA, CAMDEN, N. J.

Easy identification of all electrical service outlets is assured at the Camden Plant of RCA Victor. A simple color code does the trick. This code has proved an indispensable aid in reducing accidents, speeding up machine installation, and lowering maintenance costs.

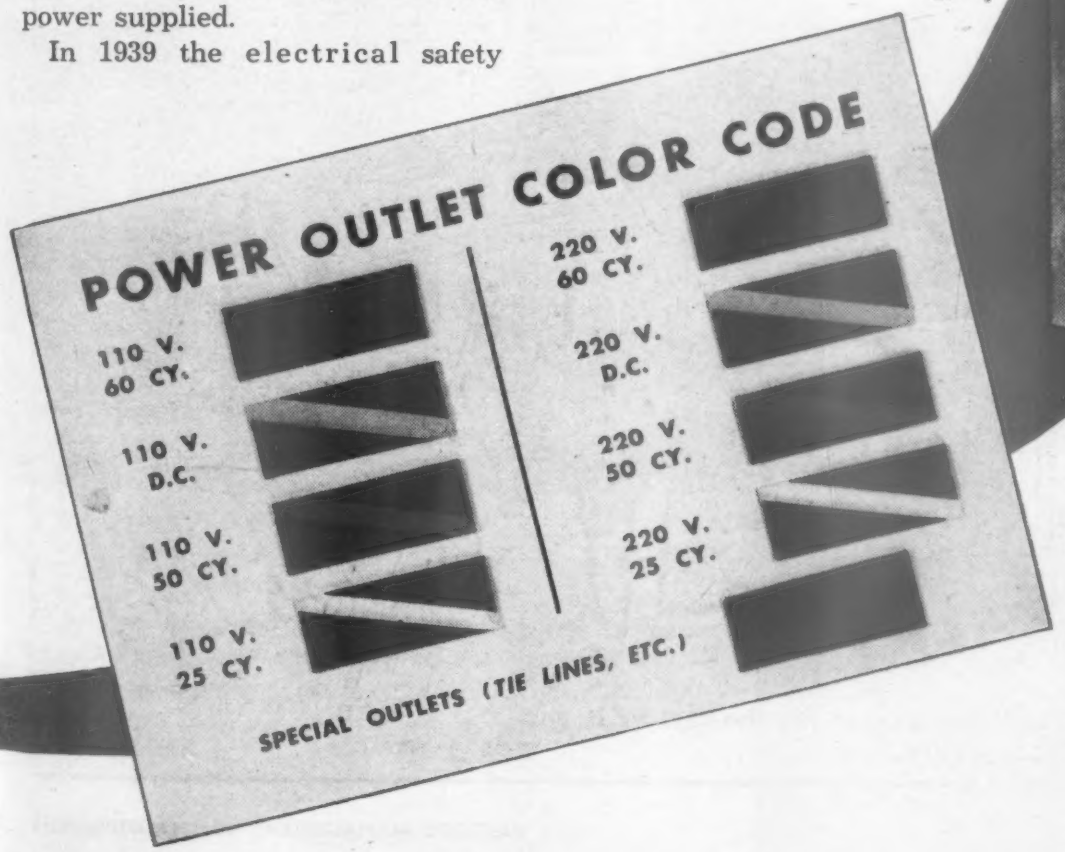
As many as six standard low-voltage power services are distributed to each manufacturing area. In certain specialized areas, as many as fourteen different services are used. Although outlets are polarized wherever possible, there were many occasions before coding when equipment was plugged into the wrong voltages or frequencies, resulting in damage to equipment or injury to personnel.

It was likewise extremely difficult to determine quickly the types and extent of service available in a specific section. Layout engineers and maintenance workers have been known to spend as much as 2 hours tracing a single complicated conduit system to its source in order to determine the exact nature of the power supplied.

In 1939 the electrical safety committee, cooperating with the maintenance section, established a standard color code which has been in use ever since. Solid background colors were selected to indicate

All electrical attachment outlets and outlet receptacles are painted in code colors to prevent wrong connections

Switchboxes, too, get a color code. In the past three years there have been no known cases of misidentification or injury to machinery from low-voltage power connections



In addition to large charts prominently displayed throughout the plant, small 4x5-in. color code cards have been distributed to plant maintenance workers, engineers, and test maintenance men. Solid background colors indicate voltages; diagonal stripes indicate direct current or currents other than 60-cycle

voltages, and diagonal stripes were superimposed on these colors to indicate direct current, or currents other than 60-cycle. It was first proposed to utilize stripes for indicating alternating currents, and solid colors for direct current. This seemed consistent with electrical symbols. However, after it was found that at least half of the services were either 110-volt 60-cycle, or 220-volt 60-cycle, it became obvious that the task and cost of painting receptacles could be reduced by reserving stripes for the less common currents.

As the first step in applying the system, charts approximately 18x24 inches in size were prepared with painted colors and installed in prominent locations on all floors. Small cards, 4x5 inches, were printed in color and distributed to maintenance workers, engineers, test maintenance men, and others who needed such information.

Color painting the outlets was the most difficult task. It was first started in an orderly fashion, taking one building at a time, but it involved so much effort and expense that it was ultimately decided to allow less important areas to remain uncoded until the regular repainting period. Approximately 2½ years were therefore required before the painting of all the outlets in the large plant at Camden could be completed.

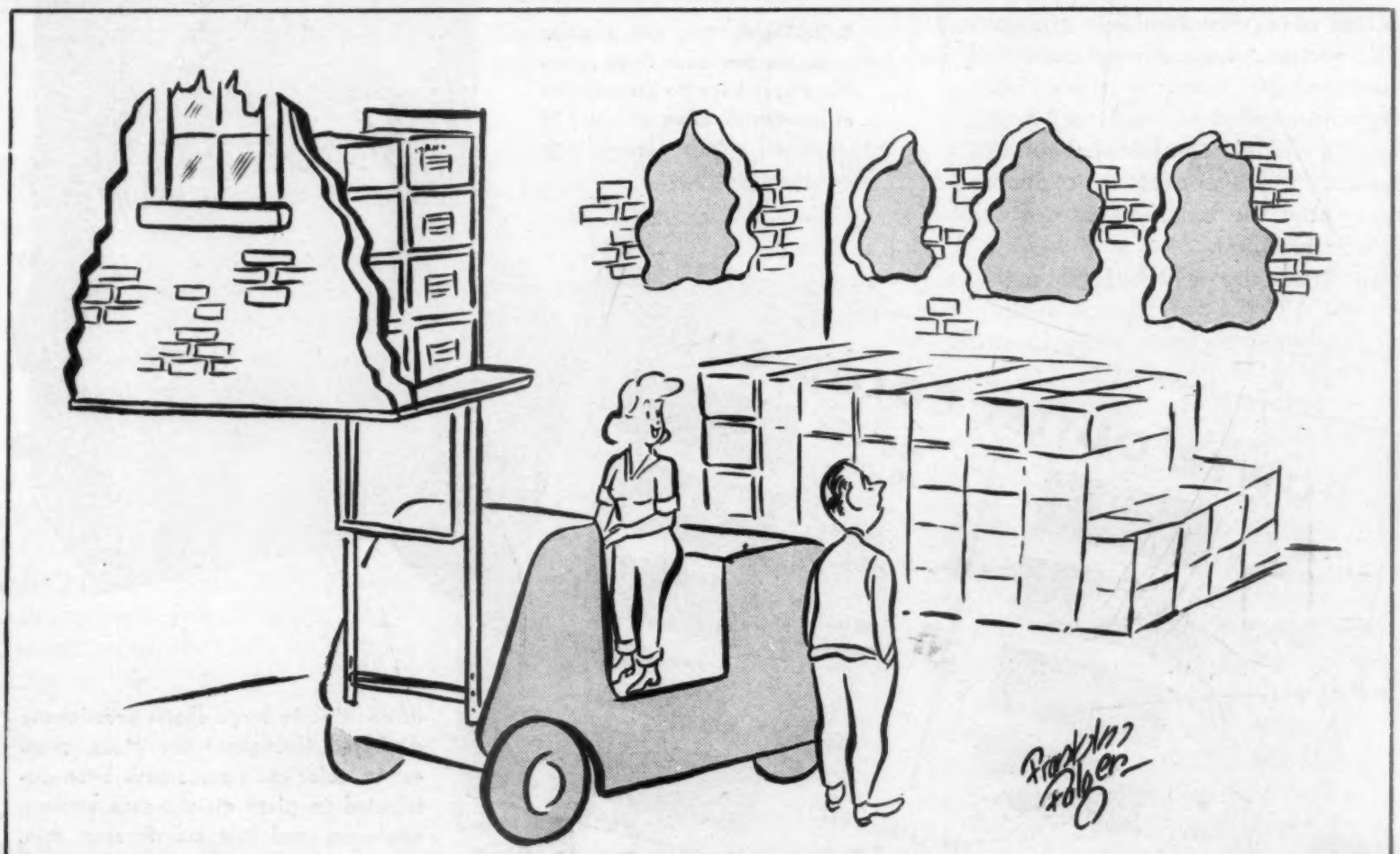
Where Code Is Used

The color code has been applied to all single and duplex outlet boxes or receptacles, to attachment outlets on drop cords, and to switchboxes. It has not been used for permanent machine connections. In certain specific areas, especially test sections, some coding of equipment has been done where it was felt desirable. Consideration is being given to coding all portable units, although to date attachment plugs in general have not been coded.

Recently the purpose of the system was expanded to include the identification of all principal power risers, feeders, transformers, circuit breakers, switches, and special lines. Marking of special lines was used, for example, to indicate a non-standard power supply of 22½ volts, or a link between two test areas that are independent of the building power system, or a distribution of local power from a motor-generator set to other equipment within the same area.

This identification was accomplished not by color coding, but by actual descriptive lettering. Risers and feeders are labeled to indicate (1) voltage and current, (2) source, and (3) destination. Switches, circuit breakers, and transformers show (1) voltage and current, and (2) equipment or areas serviced. Immediately following any new installation a sign painter is given sketches from which he letters all such services.

The system has worked so well that in the past three years there have been no known cases of misidentification or injury to machinery from wrong low-voltage power connections. Moreover, similar systems have since been adopted in three other RCA Victor plants.



"I'm beginning to get the feel of it now"

PAINTED THE PLANT IN COLORS—HERE'S HOW

WILLIAM J. L. ROOP • CHIEF ENGINEER, GILLETTE SAFETY RAZOR COMPANY, BOSTON

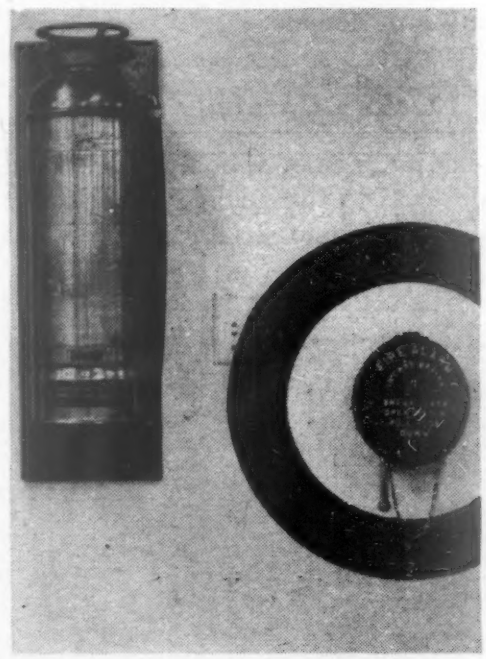
A paint-up program costs a good deal of money. But it pays. That, at any rate, is how we feel about it here at Gillette. It has paid us because the new paint has done things to worker morale. It has made the plant a pleasanter place to work. It has provided an urge to keep the plant clean. And, not to be overlooked, it has improved overall illumination.

Here's what we did and how we did it.

White and green in various shades had been used throughout. That is, walls and ceilings were a glossy white. A medium or dark green dado extended from 3 to 4 feet above the floor. A black stripe or band about 2 inches wide was used to separate the dado from the upper white wall.

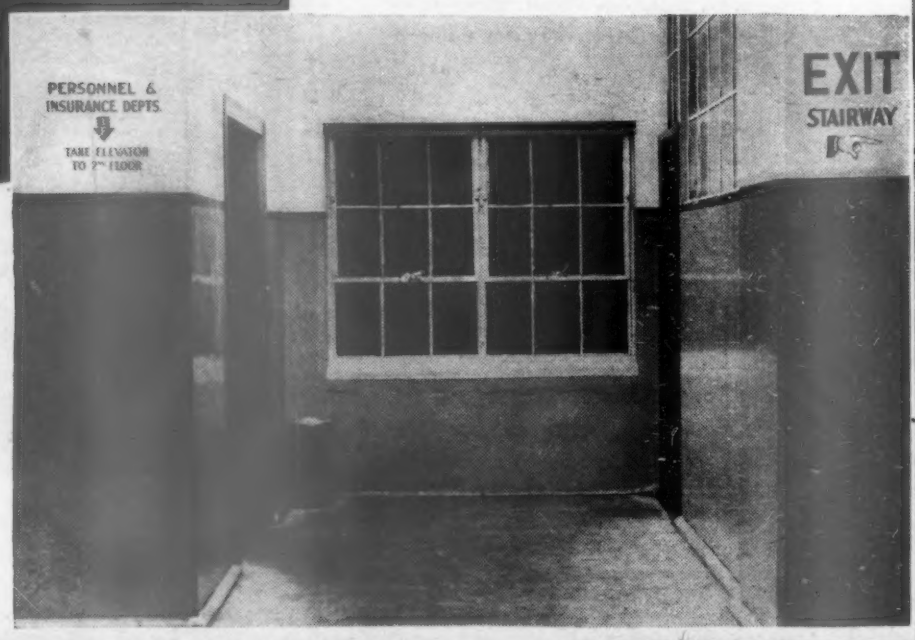
Aside from the fact that the plant needed repainting nearly everyone, workers and executives alike, was tired of the old color scheme. The decision to use color was practically automatic, but the question of what combinations of colors should be used posed a problem whose solution required considerable study. It was obvious that one combination of colors would not be suitable for all the different areas, but at the same time it was considered desirable to follow a consistent, harmonious pattern throughout.

The first step in selecting the color scheme was to divide the plant de-



Fire alarm boxes are marked by a bright red circle, 2 feet in diameter, enclosing a white circle. Extinguishers are mounted against a red background

Ceiling areas above lineshaft drives were painted black. This was done in order to make invisible the dark streaks formed by dirt thrown off the belts



To help personnel find their way around the plant, the number of each department and area was stenciled above the entrance. In addition, direction signs have been used liberally. Identifying letters and numbers are bright red, 6 inches high

partments into four general groups. For the purpose at hand these groups were designated as: (1) Manufacturing; (2) stores and shipping; (3) administrative offices; and (4) model. The so-called model areas include the inspection department, blade wrapping, shaving cream manufacture, as well as the dispensary.

In setting up these groups, careful consideration was given to such factors as the nature of the work carried on (whether light or heavy, dirty or clean), the amount of natural light finding its way into the area, and whether the workers in the department are predominantly male or female.

Colors Carefully Studied

A large amount of study has been devoted to the psychological effect of color in industrial plants, and the best combinations to use. Full advantage was taken of the results of these studies, in selecting the color combinations to be used here. The combinations eventually chosen for the departmental groups mentioned previously are shown in the table on the facing page.

A departure from customary practice was made in using black paint on the ceiling immediately over lineshaft drives. A number of such drives are used here. In time the ceiling above these drives becomes discolored from dust thrown off the belt. Inasmuch as it is difficult to prevent the formation of these dirty streaks it was decided to make them invisible by causing them to form on a black background. There were some misgivings as to how these black areas—holes in the ceilings, as they were called—would affect the appearance of a department. However, the appearance is not at all displeasing. In fact, the black areas are not so noticeable as might be expected.

It will be seen from one illustration on page 97 that care was taken to mark fire alarm boxes as plainly as possible. The boxes are painted bright red. Surrounding them is a white circle which is enclosed by a red circle approximately 2 feet in diameter.

Fire extinguishers, too, are mounted in the center of a large red rectangle.

Machine tools and all production equipment formerly had been painted a very dark gray, which had become almost black. They are now painted a medium machine tool gray. Pushbutton housings, starting boxes, handles, guards, and danger points on the machines are painted a bright orange color.

Forty Lines, Seven Colors

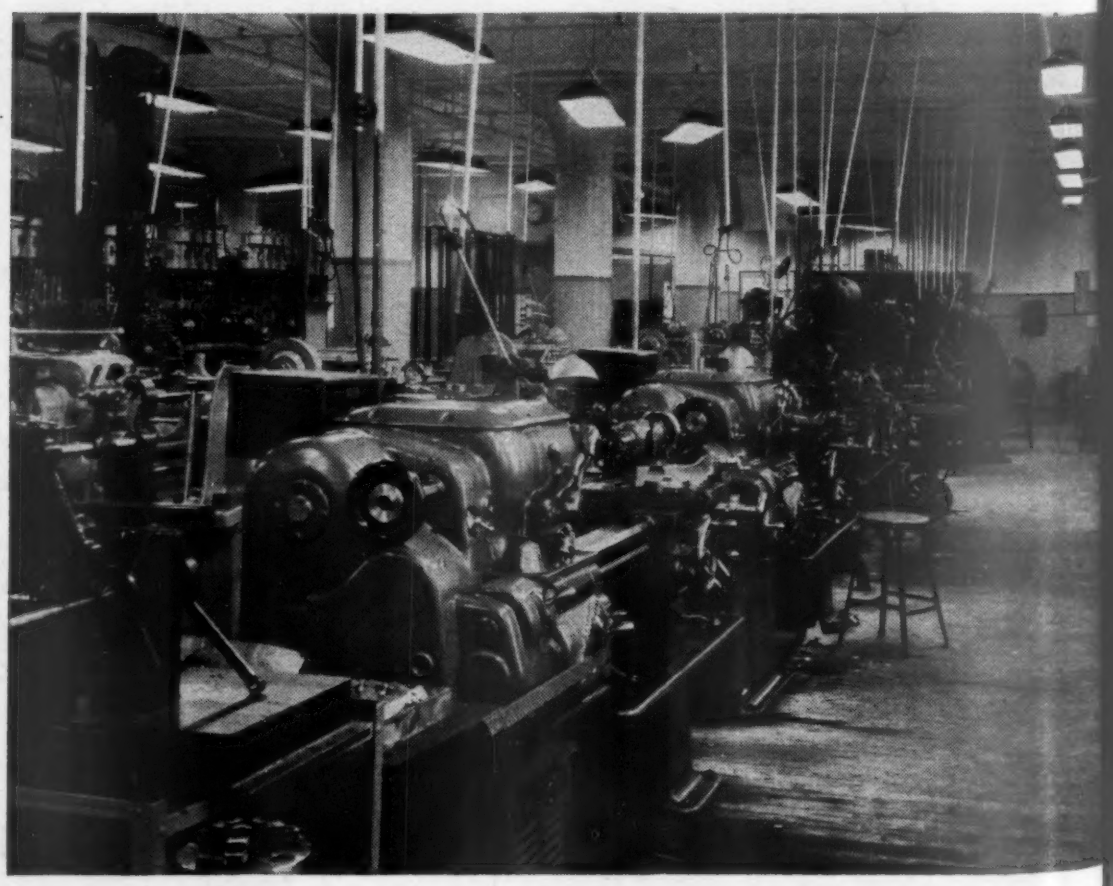
All equipment in the powerhouse was painted dark green, with orange markings.

Identification of piping and conduit systems presented another problem that required considerable

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 142) . . . a summary of **LABOR DEVELOPMENTS** (page 220) . . . things **YOU WANT TO KNOW** more about (page 208)

Placing a trash receptacle in the corner of every stair landing has practically eliminated littering. These receptacles are 5-gal. paint cans. They are painted yellow, carry a single word, "Please"



Machine tools and all other production equipment were painted a medium machine tool gray. Pushbutton housings, starting boxes, handles, guards, and all danger points on the machines were painted a bright orange color

study. The ASA Color Code for piping identification covers a number of services, but in this plant it was necessary to mark 40 different pipe and conduit lines. Furthermore, it was desirable to use only seven colors for coding.

Pipe and conduit lines are mounted overhead, and for the sake of appearance they are painted the same color as the ceiling, except for the color bands. Acoustic ceilings have been installed in a number of areas. These ceilings were not painted. In the areas the pipelines were painted to match the ceiling as closely as possible.

The identifying color bands are put on pipelines close to the wall through which they enter a department. Single color bands are about 3 inches wide. The largest bands, involving more than one color, may be up to 2 feet long. Since it would be difficult to remember all the codes, the identification chart is permanently attached to the wall, immediately below the pipeline.

Easy Identification

An innovation, so far as this plant is concerned, that has been found to be helpful involved stenciling the number of each department or area above the entrance. The letters and numbers that identify the departments are 6 inches high and are a bright red, in order to provide maximum visibility.

The reaction of plant personnel to the new color schemes has been gratifyingly favorable. Everyone likes them. The departments certainly are brighter, more cheerful-looking, and rough tests indicate that at least in some cases illumination has been increased 5 to 10 per cent through the greater reflective power of the new plant.

Another thoroughly desirable by-product is the marked tendency on the part of operators and others to keep the plant cleaner. Operators see that their machines are clean. There is less tendency to scatter refuse around, which makes it easier to maintain a high standard of housekeeping.

Altogether, it is felt that repainting the plant in its new color schemes has had a distinctly favorable effect on employee morale.

COLOR COMBINATIONS IN PLANT DEPARTMENTS AND AREAS

(ALL CEILINGS ARE WHITE, EGGSHELL GLOSS)

Manufacturing Areas	Upper walls	Pale gray green, pastel tint, eggshell gloss
	Dado	High-gloss medium gray green, 6 feet high
	Stripe	Deep green, 2 inches wide
Stores and Shipping	Upper walls	White or very light gray, eggshell gloss
	Dado	High-gloss medium gray, 5 feet high
	Stripe	High-gloss dark gray, 2 inches wide
	Doors	Dark gray, eggshell gloss
Administrative Offices	Walls	White, eggshell gloss, 16 inches below white ceiling (to reduce height). Medium-gloss ivory to baseboard
	Baseboard	Medium gray green, 12 inches high
	Doors	Medium gray green, same as baseboard
	Partitions	Light gray green
Maintenance Shop	Upper walls	Light ivory, medium gloss
	Dado	Medium green, 6 feet high, high gloss
	Stripe	Deep green, 2 inches wide, high gloss
	Doors	Deep green, high gloss
Cafeteria	Upper walls	Light ivory, medium gloss. There is an acoustic ceiling in this area. Pipes and beams were painted to match the ceiling, and this color was carried down the walls to the depth of the beams
	Dado	Deep shade of ivory, high gloss, to baseboard
	Stripe	Maroon, 2 inches wide, high gloss
	Baseboard	Maroon, 8 inches high
Razor Blade Inspection and Wrapping	Upper walls	Very light gray green, medium gloss
	Dado	Slightly darker gray green, 5 feet high, high gloss
	Stripe	Medium gray green 2 inches wide, high gloss
	Doors	Deep green, high gloss
Shaving Cream Manufacture	Upper walls	Pale blue, semi gloss
	Dado	Medium blue, 5 feet high, high gloss
	Stripe	Deep blue, 2 inches wide, high gloss
	Doors	Deep blue, high gloss, same as stripe
Dispensary	Walls	Very pale green, medium gloss, down to baseboard
	Baseboard	Ivory, high gloss, 2 inches high
	Doors	Ivory, high gloss
Toilets and Washrooms	*MEN'S*	
	Upper walls	Light ivory, medium gloss
	Dado	Tan, 6 feet high, high gloss
	Stripe	Medium gray green, 2 inches wide
	Baseboard	Black, 8 inches high
	WOMEN'S	
	Upper walls	Light peach, medium gloss
	Dado	Dusty rose, 5 feet high, high gloss
	Stripe	Deep rose, high gloss
	Doors	Deep rose, high gloss
	Floors	Black and maroon asphalt tile in both men's and women's rooms
Elevators, Wells, and Penthouses	Walls	Light ivory, medium gloss
	Cabs	Deep gray green
	Doors	Medium tan
Stairwells	Ceiling	White, eggshell gloss
	Underside of stairs	White, eggshell gloss
	Upper walls	Light ivory, medium gloss
	Dado	Medium gray green, 5 feet high, high gloss
	Stripe	Black, 2 inches wide, high gloss
	Risers and handrails	Black, high gloss

WORKER INDEPENDENCE AGAIN A FACTOR IN LABOR RELATIONS

WHITING WILLIAMS • CONSULTING EDITOR, *FACTORY*

Angels will grieve and devils grin if Mr. Industrial Manager's radar does not function to guide him in these uncertain times. It must pierce the cloud of current strikes, wage-price-profit disputes, threatened "cloudbursts" of inflation or deflation, labor-law wrangling, and similar uncertainties. It must reveal a new and constructive feature in the surrounding landscape—namely, a more independent, freer, and more reasonable attitude than has been shown by our rank-and-file worker in considerably more than ten long years.

Without doubt, that's the meaning of such emerging contours as these:

1. Boss Public's demand in last November's elections for the end of that political alliance which was formed in 1935 between the federal government and what later became the CIO.

From its beginning, this alliance has played a much more important role in our entire national life than is generally understood. According to certain labor leaders who were first consulted, its purpose was partly political—to obtain "party security" by corralling several millions of wage earner votes. But its main objective was economic. With John Lewis leading the secession, this effort to "organize the unorganized" was expected by President Roosevelt and his economic adviser, Lord Keynes, to enable these millions to demand and obtain a larger share of the national income, and thereby end the depression and also prevent its later return.

From the very first, this hoped-for advantage of universal unionism was evidently taken to justify all sorts of governmental favoritism and unfairness at every level from the local "trial examiner" up through the NLRB and related federal agencies to the sacred precincts of the Supreme Court. It must be recognized, however, that that alliance and its multitude of unfairnesses had the support of a public opinion which, in line with its traditional interest on behalf of the under-dog, especially during hard times, everywhere condoned the notable failure of even local judges and police to enforce the existing ordinances governing such matters as picketing.

Altogether it must be said that this same public opinion supported the government's effort to build a wall between employer and employee for the actual benefit less of this employee than of his "freely chosen" leaders.

It is, accordingly, of the utmost importance to note that those fall elections registered a distinct protest against that alliance and its one-sided concomitants as witnessed and experienced.

2. Almost as important is it that the White House "got" the meaning of this protest.

To be sure, President Truman has lately put the blame for high prices entirely upon business and industry. Nevertheless, it is worth recalling that he did confirm that November vote when he exhibited his "Missouri mule" policy against John Lewis on December 7—also when he later stood firmly by his Attorney General and his Interior Secretary against the same opponent.

Decidedly worth noting is it also that the White House has lately given vastly less approval to general wage raises that it gave to the similar demands that caused the stoppages in steel and elsewhere in 1945. Without doubt, those industry-wide strikes weakened the long-term position of International Headquarters because the latter assumed that White House approval made proper explanation, proper "selling," of the walk-outs to the rank-and-file members appear needless. Quite surely, further, the White House deserves some credit for certain gratifying about-faces lately executed by the NLRB and even the Supreme Court.

3. Whether as the result or the cause of the above, the fact is that our radar screen now discloses a significant measure of improvement in the thought and feeling of great numbers of wage earners.

To the millions of their November protest votes must be added, according to report, a widespread increase in current man-hour productivity. Toward the recent peaceful end of various important negotiations, much credit must unquestionably be given to the almost universal prayers for peace uttered by union members "fed up" with their own or others' strikes. (Believe it or not, these prayers were specifically mentioned by the Communist Party's labor strategists, who counseled against any walk-out until *all* CIO unions could strike in unison—and advised unions to concentrate meanwhile on soaring prices and "outrageous" profits.)

For the same peaceful procedure, genuine credit must also be given to William Green's too-little-noticed testimony (FACTORY, February, 1947) to the effect that, under current conditions, the worker is helped immensely less by strikes and higher wage rates than by cooperation on behalf of greater productivity and lower prices.

By no means insignificant, furthermore, is the number of locals that have lately staged successful

revolt against their trouble-making Red leaders—also the increasing impatience with which the hoped-for head-on meeting of this issue in CIO's highest echelons is awaited.

Still further, the number increases daily of locals that, without threatening withdrawal, refuse to follow the most arbitrary and least reasonable of those country-wide, across-the-board orders so frequently issued by their International Headquarters. Add to all this the recent polls which disclose that most wage earners oppose the closed shop and related forms of compulsory union membership.

4. Since every Senator and Representative must perforce know and respect the current feelings of his constituents, all the above developments are supported by the present willingness of Congress to discount, at long last, the political power so long claimed by many labor leaders and hence to propose stern control of these same leaders on behalf of members as well as public.

5. Even though it can't be revealed on the radar screen, is there any doubt that the present labor landscape now shows immense improvement in its psychological "climate"?

Or that this improvement is the natural result of the public's and the rank-and-file workers' actual experience with a leadership that had become both too remote and too politically minded to suit its members or anyone else?

What Management Can Do About It

Every fair-minded citizen hopes that forthcoming legislation will, instead of "smashing" unionism or wrecking collective bargaining, give a fairer break for *employer,* enforce more responsibility upon *labor leader,* and favor less wall-building and less routine intervention by *government*—will, in short, insist that the crux of the labor problem is the well-being and the liberty less of the union than of the individual union member and of the individual public citizen.

But whether Washington's strenuous wrestlings bring satisfaction or disappointment, the wise manager will perceive that, *already,* he can expect a more cooperative hearing from his rank-and-file workers than in considerably more than a decade. So his present lively effort to improve his "communications" is all to the good. This effort will prove futile, however, unless he first disposes of several "hangovers" from those years of government-fostered industrial separation and warfare.

One of these hangovers is the way Mr. Manager has, in many cases, confined his personal contacts so long and so fully to his committee men that he now has little idea as to just what kind of people he has working for him and what's on their minds. Worse still, he now tends to attribute to these his rank-and-file employees all the belligerence, unreasonableness, and related shortcomings so frequently exhibited by their spokesmen-leaders.

To be sure, those leaders are troublesome and powerful. But what they know better than he appears to know, is that their power ceases the moment they lose their followers. Willy-nilly, they must perform neither as workers nor as businessmen, but as *politicians*—with their ears at least partly open to the mood of their constituents. Hence the most practical way to lessen the pressures the leader puts upon management is to lessen the pressures that his constituents put upon *him.*

Another hangover is revealed to anyone who travels widely. A surprising number of executives seem to have got so much "kick" out of their battling with the union that they appear reluctant to be done with it. If they aren't licking their *wounds* over some defeat suffered, they are licking their *chops* over some victory won! So they—along with their personnel directors—appear unwilling to make their labor relations program into something *more* than the negotiation and observance of their union contract.

Third hangover is the current tendency (due to years of enforced separation) to rely too much upon the written or printed instead of the *spoken* word—too much upon the power of *any* kind of official "communications" as compared with the vastly greater power of worker *experience* with the employer there on the daily job.

It is because the well-being and the liberty of the individual worker-citizen—the crux of the whole matter—was long given inadequate attention by the employer that it appeared good political strategy for a Hard Times Government to favor turning this responsibility over to the union leaders. It was because they, in turn, proceeded in 1946 to misuse their new powers for gaining predominance over each other that many members joined a confused, exasperated, and frightened public to make November's protest. This protest is not so much *against* unionism or *for* management as it is on behalf of a *get-together* as fairer to all the individuals concerned, whether in industry or out.

Whatever laws are passed, such a get-together now requires Mr. Manager to regain his respect for himself, for his fellow-workers, and for their combined function, along with renewed faith in their wish to play fair as reasonable, God-fearing fellow-Americans in a weary, goods-hungry, post-war world. In demonstration, he will wisely consider such steps as these·

1. Perceive that the spirit underlying the union contract is more fundamental than any of its paragraphs or clauses. If these merely prescribe the rules of battle, they give pleasure only to the "hotheads."

2. Give more continuous top-level attention—without waiting for the hectic emergency—to building company policies and procedures that protect and promote the security, opportunity, and liberty of all employees via both the union agreement and all the work-day's various contacts.

3. Because the foreman is the chief party to these contacts, restore to him the security, status, and prestige of which he was too often deprived by various governmental unfairnesses since 1935. (Just now

such restoration is more urgent—also much more complex and difficult—than his "training" in any specific techniques.)

4. Help the foreman, as management's honest-to-goodness representative, to re-establish close relations with his workers and to regain their confidence by learning their individual fears and aspirations—in full assurance that these as learned and reported are the sure means to all practical managerial helpfulness.

5. Build plantwide pride by regularly posting departmental output, per cent of quota, or other measurement—with due appreciation expressed for excellence. Even when accurate measurement is impossible, this should not prevent inventing some kind of *target;* without it, achievement is no fun.

6. Clear out all the bottlenecks that needlessly delay decisions and obstruct friendly contacts on and between all administrative levels. Also end those cross-department interferences by unauthorized persons, which make foremen and workers complain: "I get to wondering who's my boss."

7. Take seniority in lay-offs seriously, but oppose without ceasing undue increase of its importance as a factor in promotions. Otherwise, a dead hand is laid upon the entire enterprise.

8. Don't try to explain our profit-and-loss system apart from your company's operations. If, even then, listeners show a discouraging amount of "mental absenteeism," don't abandon the effort. Instead, use terms closer to their daily interests and experience.

9. To make sure you know and understand these daily interests and experience, look up your typical employee's age, service-term, education, nationality background, leisure activities, etc., etc.

10. In short, summon the courage and faith required to expect the current landscape's "climate" to bring about, not the demise of unions, but only their increased willingness to promote the short-term and the long-term well-being and liberty less of themselves than of their individual members as patriotic, independent Americans.

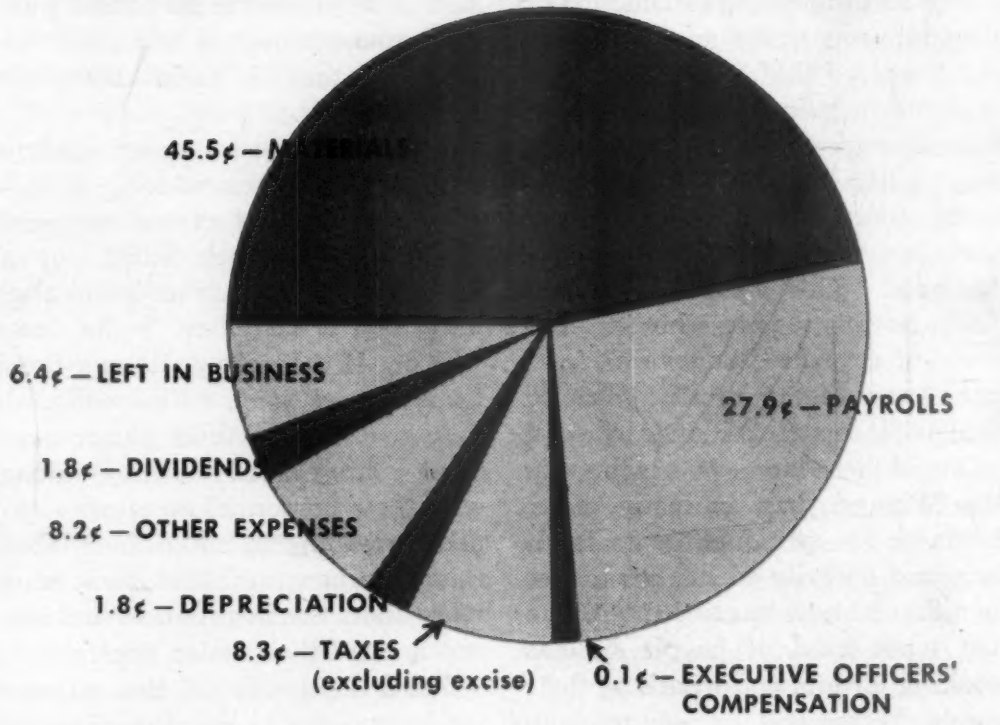
TELLS WORKERS FACTS IN COMPANY PAPER

When Goodyear's chairman talks money, he talks turkey.

With the help of the chart (right), P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Company, Inc., explained 1946 operations to employees in the company newspaper.

The chart shows graphically how the money was spent—where it came from, and what the company is doing to keep it coming. Litchfield pointed out that 1946 would happen just once. Volume and profits set peacetime records, but they came from catching up with war-born demand, from long runs of uncomplicated products, from stable prices and an absence of price cutting, from plant expansion already completed, and from unprecedented foreign operations in areas where competition had been wrecked by the war.

How Goodyear's Dollars Were Divided in 1946



THE COST OF MAINTENANCE IN SEVENTY-

Compiled from data on profits and operations contained in a survey of the Securities ar

INDUSTRY[1]	NUMBER OF COMPANIES		TOTAL NET SALES, DOLLARS[2] (in Thousands)	
	1943	1944	1943	1944
Agricultural machinery and tractors	10	10	1,268,113	1,604,798
Aircraft and aircraft equipment	32	34	8,052,976	9,152,252
Apparel and related finished products (shirts, ties, hats, underwear)	16	17	180,050	211,991[11]
Automobile parts and accessories	80	80	3,684,280	4,080,493
Automobiles	10	10	5,870,347	6,805,016
Biscuits and crackers	6	6	315,727	351,867
Bolts, nuts, and rivets	6	7	100,822	113,741
Bread and cake	8	9	329,609	381,378
Breweries	27	27	140,815[6]	167,504[6]
Building equipment (stoves, furnaces, pipefittings, locks)	23	22	635,833	678,229
Building materials other than clay products and cement (glass, roofing, metal sash, insulation)	18	18	538,606	572,004
Cement	8	8	73,981	62,201
Chemicals	41	42[8]	2,499,773	2,461,268
Chewing gum, candy, and confectionery	11	9	226,170	220,896[11]
Cigarettes	6	6	1,553,032[12]	1,601,732[12]
Cigars	8	8	99,594[12]	103,761[12]
Clay products (brick, tile, refractories)	13	13	81,897	70,624
Clocks and watches	5	5	75,187	97,651
Commercial cars and trucks	12	15	583,770	695,396[13]
Construction, mining, and related machinery (power shovels, loaders, graders)	13	12	328,580	372,198
Dairy products	9	9[11]	1,341,918	1,452,351
Distilleries	10	9	914,015[14]	1,226,298[14]
Drugs and medicines	15	14	582,885	619,880
Electrical household appliances and related products	18	18	199,107	244,815
Electrical supplies and equipment (switches, starters, wiring devices, instruments)	33	33	2,687,139	2,974,294
Engines and turbines	9	9	419,263	500,245
Fertilizers	5	5	123,520	140,031
Firearms	3	3	182,039	85,532
Floor coverings and miscellaneous textiles (linoleum, rugs, automotive fabrics)	14	14	366,529	374,108
Food canning and preserving	10	10	335,315	335,548
General industrial machinery (pumps, air compressors, meters, valves, air tools)	41	41	1,170,008	1,166,017
Grain mill products (flour, cereals)	10	10	633,599	791,536
Grocery specialties and miscellaneous food products	14	14	866,318	954,984
Hosiery	12	11	97,896	98,876
Household utensils	6	6	40,439	43,748
Iron and steel foundry products	9	9	84,035	92,161
Leather tanning	5	5	52,064	49,808
Lumber and lumber products (plywood, sash, boxes, furniture)	17	17	242,932	258,401
Manufacturing industries—miscellaneous (optical goods, ice, dental equipment, mattresses)	29	32	364,079	581,864
Meat packing and allied products	14	13	4,606,920	4,732,038
Metal and glass containers	9	9	676,248	774,694
Metal-working machinery (machine tools, saws, drills, presses)	29	31	724,799	620,046

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SIX INDUSTRIES

d Exchange Commission

TOTAL MAINTENANCE AND REPAIR COSTS, DOLLARS[3] (in Thousands)		MAINTENANCE AND REPAIR COSTS PER CENT OF NET SALES					
		1943			1944		
1943	1944	Individual Company HIGH	Individual Company LOW	Industry Average	Individual Company HIGH	Individual Company LOW	Industry Average
40,172	52,924	4.6	1.0	3.2	4.4	1.7	3.3
115,626[4]	129,010[5]	4.2	0.4	1.4	4.2	0.3	1.4
1,960	2,060[11]	2.8	0.2	1.1	1.8	0.1	1.0
108,824	118,762	10.6	0.4	3.0	9.0	0.4	2.9
367,807	391,594	8.3	1.3	6.3	7.6	0.8	5.8
6,088	6,973	2.7	0.8	1.9	2.1	1.6	2.0
3,514	4,318	6.3	0.1	3.5	6.3	0.1	3.8
8,813	10,996	4.5	1.7	2.7	4.2	1.9	2.9
3,522	5,511	7.5	0.2[7]	2.5	10.1	0.6	3.3
18,330	19,756	5.7	0.8	2.9	4.6	0.3	2.9
21,430	24,671	11.2	0.6	4.0	11.5	0.7	4.3
5,018	4,377	13.7	2.9	6.8	14.4	2.8	7.0
110,514[9]	125,011[10]	11.2	0.1	4.4	12.8	0.2[7]	5.1
2,104	2,200[11]	2.6	0.2	0.9	1.5	0.4	1.0
3,116	3,783	0.5	0.2[7]	0.2	0.7	0.2[7]	0.2
803	956	2.1	0.5	0.8	2.1	0.4	0.9
6,440	5,298	12.6	0.7[7]	7.9	12.1	3.0[7]	7.5
2,055	2,008	5.0	1.0	2.7	2.8	1.1	2.1
6,107	7,523[13]	4.3	0.4	1.0	2.0	0.2	1.1
8,528	9,960	6.8	0.7	2.6	6.7	0.8	2.7
27,234	28,670	3.7	0.8	2.0	2.8	1.0	2.0
6,342	8,802	3.4	0.3[7]	0.7	1.2	0.2	0.7
6,689	8,361	2.7	0.5	1.1	3.5	0.2	1.3
5,103[15]	6,212[15]	5.3	0.5	2.6	4.6	1.0	2.5
54,332	62,569	6.0	0.3	2.0	7.1	0.3	2.1
8,447	9,347	3.7	1.0	2.0	4.7	0.9	1.9
6,604	8,294	10.9	2.3	5.3	12.0	2.5	5.9
4,006	2,527	2.2	0.1	2.2	4.0	0.1	3.0
13,110	13,870	5.3	0.6	3.6	5.3	1.0	3.7
7,274	9,011	11.8	0.9	2.2	5.5	1.1	2.7
24,808	25,934	12.3	0.3	2.1	10.9	0.2	2.2
4,185	5,363	1.2	0.2	0.7	1.0	0.3	0.7
12,724	15,538	3.3	0.4[7]	1.5	4.1	0.4[7]	1.6
1,657	1,562	2.9	0.6	1.7	2.6	0.9	1.6
1,975	1,839	8.6	0.7	4.9	6.3	0.9	4.2
5,774	6,973	10.2	2.4	6.9	10.9	3.0	7.6
910	1,134	2.7	0.5	1.7	4.8	0.9	2.3
4,184	4,750	2.8	0.2	1.7	3.0	0.1	1.8
9,275	15,209	4.3	0.1	2.5	4.9	0.3	2.6
41,793	53,753	1.1	0.2	0.9	1.5	0.2	1.1
26,021	32,935	6.5	1.7	3.8	7.5	2.2	4.3
16,491	16,553	8.0	0.2	2.3	1.6	0.2	2.7

Footnotes on reverse side

NON-STOP PRODUCTION VIA CONVEYORS

It's truly non-stop production at Zenith Radio Corporation, Chicago. Conveyor lines, totaling over 5 miles in length and of several types, are laid out in the form of a giant *U*; the main line follows the *U* pattern, and the many subsidiary or feeder lines are either straight-line or in the form of smaller *U*'s All materials are received and started on their way at one end of the shop; completed radios are shipped from the other.

Unit Costs Cut

With a daily production capacity of more than 12,000 radios in many models and types, engineers and production men decided they would standardize all conveyor lines. *Everything* was to be standardized—conveyors, jigs and fixtures, workbenches, and fabrication sequence. The result—all production schedules reached and exceeded. Unit costs cut. Product quality improved. Employee morale raised and labor turnover lowered.

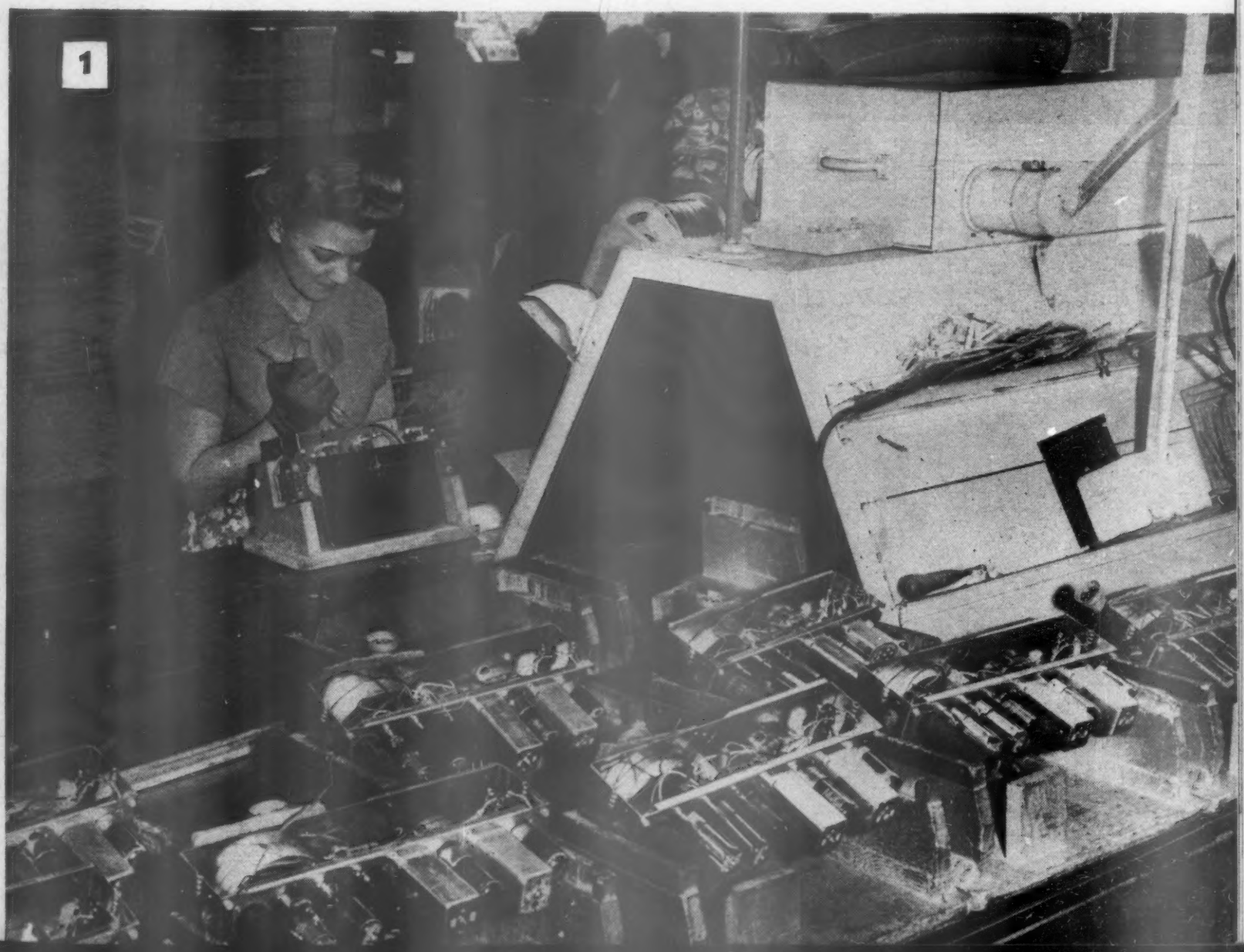
Conveyors are standardized so that they can be moved from one location to another or spliced into other sections with little difficulty. Jigs and fixtures are quickly adaptable for use on almost any model. Such arrangements have eliminated the necessity for complete equipment change when running a different model. Workbenches have standard wiring and layout, and can be used in any part of the plant. Operators do not need special skill or elaborate training, because their work has been so subdivided that they do but one simple operation.

At the starting end of the final assembly line, thousands of parts are received—bolts, screws, lugs, tubes, wire, condensers, knobs, pointers, speakers, magnets. This department handles many thousands of major parts a day, in addition to many minute parts, which come in gross, box, and barrel lots. Special scales and measuring machines are used to count parts.

Stocked at Night

Incoming materials that survive Zenith tests are stored temporarily in a central stockroom where they are labeled and made ready for production lines. The trip to production is made at night. Parts are placed in special containers at work stations for each operator. When employees arrive, the line assembly benches are ready for an uninterrupted production day.

1 Radio chassis are assembled on long straight lines. At the point shown here chassis are ready for aligning and testing. Sets are re-



such restoration is more urgent—also much more complex and difficult—than his "training" in any specific techniques.)

4. Help the foreman, as management's honest-to-goodness representative, to re-establish close relations with his workers and to regain their confidence by learning their individual fears and aspirations—in full assurance that these as learned and reported are the sure means to all practical managerial helpfulness.

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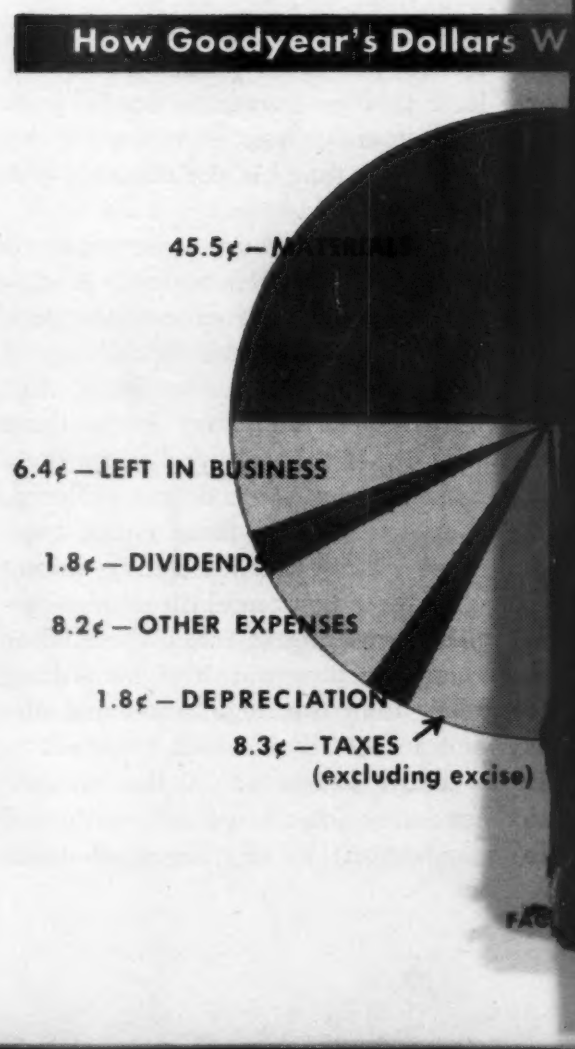

THE COST OF M

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Miscellaneous iron and steel steel springs)	
Non-alcoholic beverages	
Non-ferrous metals, including	
Non-ferrous metal products (c bronze, copper shapes)	
Office machinery and equipm	
Oil refining	
Paints and varnishes	
Paper and allied products	
Pens and pencils	
Photographic equipment	
Pig iron	
Printing and publishing, othe periodicals (books, comm	
Periodicals and newspapers	
Printing trades machinery	
Raw cane sugar	
Radio and radio equipment	
Railroad equipment (locomotiv forgings)	
Rayon yarn	
Rolling mills without steel-maki	
Safety razors	
Screw machine products	
Shipbuilding	
Shoes	
Snuff and miscellaneous toba	
Special industry machinery rubber-working)	
Steel producers with blast fur	
Steel producers without blast	
Sugar refining, beet	
Sugar refining, cane	
Textile fabrics	
Tires and other rubber produc	
Toilet preparations and soap	
Toys and sporting goods	
Vegetable oils	
GRAND TOTAL	

1. The survey includes only tho that have securities listed and register securities exchanges under the Secur Act of 1934, or which are required reports as registrants under the Sec 1933. Only manufacturing companie ered here.

2. Net sales may include or e sales, and/or other taxes, depending eral treatment given to these items trants in the industry. Operating re may not be included, generally de the treatment of this item by the reg

3. Maintenance and repairs are

OF MAINTENANCE IN SEVENTY-SIX INDUSTRIES CO

INDUSTRY[1]	NUMBER OF COMPANIES		TOTAL NET SALES, DOLLARS[2] (in Thousands)		T
	1943	1944	1943	1944	
and steel products (pipe, forgings,					
	16	16	668,396	806,343	
rages	14	13	261,821	280,256	
including smelting and refining	23[11]	24	1,878,331	1,860,461	
roducts (copper wire, alloys, brass,					
shapes)	17	16	664,577	708,620	
d equipment	10	10	485,210	521,677	
	37	36	6,434,649[19]	7,827,909[19]	
s	9	9	163,629	186,886	
oducts	46	46	1,055,734	1,163,946	
	3	3	33,536	41,887	
ment	4	4	297,815	336,712	
	4	4	89,419	89,527	
ning, other than newspapers and					
oks, commercial printing)	14	14	117,914	133,038	
spapers	8	8	146,096	163,550	
chinery	6	6	88,831	92,446	
	15	16[11]	95,707[20]	134,977[20]	
uipment	19	22[21]	867,107[22]	1,262,684	
locomotives, cars, brakes, castings,					
	20	20	1,976,543	1,785,325	
	6	7	259,145	295,821	
steel-making facilities	5	5	102,670	107,918	
	3	3	43,173	55,422	
ucts	3	3	6,544	5,350	
	7	7	746,154	670,922	
	13	13	412,563	425,278	
eous tobacco products	4	4	40,051[12]	39,911[12]	
nachinery (food, shoe, laundry,					
)	20	21	336,459	461,519	
blast furnace facilities	14	14	6,088,018	6,056,262	
out blast furnace facilities	13	14[24]	399,319	406,382	
	6	6	128,959[25]	108,074[25]	
e	6	5	206,581	284,495	
	14	15	680,005	686,567	
er products	16	16	2,215,502[28]	2,529,905[28]	
and soap	10	10	518,172	557,693	
goods	4	4	30,337	32,410	
	5	5	294,939	367,623	
	1088	1099	71,184,135	78,410,071	2

les many thou-
ts a day, in addi-
ute parts, which
, and barrel lots.
measuring ma-
count parts.

t Night

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rip to production
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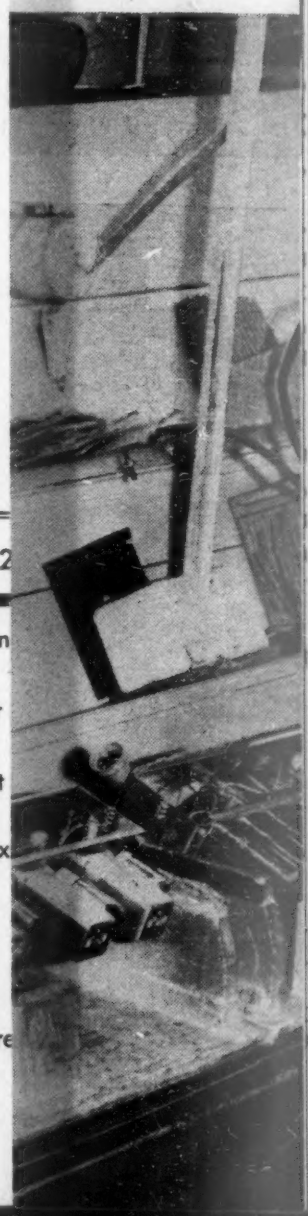


s only those companies
nd registered on national
the Securities Exchange
required to file annual
er the Securities Act of
companies are consid-

lude or exclude excise,
depending upon the gen-
hese items by the regis-
erating revenue may or
nerally depending upon
by the registrant.
repairs are the amounts reported by the registrant as its charges for these items to profit and loss, whether charged to costs or other than as costs.

4. Total for 31 registrants.

5. Total for 33 registrants.

6. Net sales adjusted to exclude excise taxes whenever amounts have been reported.

7. Actual figure reported was 0.0 per cent, with no explanation. Figure given is next lowest.

8. One registrant's 1944 report was for a 1⅔-month interim period.

9. Total for 40 registrants.

10. Total for 41 registrants.

11. Data for one company are n
these totals.

12. Revenue stamp taxes and/or
cluded in sales.

13. One registrant's 1944 report
month interim period.

14. Net sales include excise tax
taxes, and duties.

15. Total for 17 registrants.

16. Total for 22 registrants.

17. Total for 23 registrants.

18. One registrant reported figure

RIES CONTINUED . . .

	TOTAL MAINTENANCE AND REPAIR COSTS, DOLLARS[3] (in Thousands)		MAINTENANCE AND REPAIR COSTS PER CENT OF NET SALES					
			1943			1944		
44	1943	1944	Individual Company HIGH	Individual Company LOW	Industry Average	Individual Company HIGH	Individual Company LOW	Industry Average
,343	13,521	14,269	5.2	0.2	2.0	6.8	0.2	1.8
),256	1,888	2,720	2.7	0.2	0.7	3.2	0.2	1.0
),461	106,376[16]	107,325[17]	13.4	0.4	5.7	15.9	0.5	5.8
,620	24,729	29,422	6.5	0.4[7]	3.7	7.4	0.4[7]	4.2
,677	15,419	18,304	6.2[18]	1.5	3.2	6.4[18]	1.4	3.5
7,909[19]	251,450	344,285	7.2	1.1	3.9	9.4	2.1	4.4
,886	1,988	2,577	1.6	0.3	1.2	1.8	0.5	1.4
,946	47,330	59,411	9.2	0.2	4.5	10.3	0.5	5.1
,887	213	301	0.7	0.5	0.6	0.9	0.5	0.7
,712	10,282	11,379	9.2	1.8	3.5	7.3	1.5	3.4
,527	6,846	6,760	9.9	5.9	7.7	11.0	5.8	7.6
,038	1,984	2,274	3.0	0.2	1.7	3.1	0.2	1.7
,550	1,532	1,909	1.7	0.1	1.0	2.0	0.1	1.2
,446	2,099	2,162	3.9	1.7	2.4	4.1	1.6	2.3
4,977[20]	5,837	7,752	17.6	2.6	6.1	12.3	3.4	5.7
,684	16,839[23]	21,516[23]	7.0	0.1	1.9	7.7	0.1	1.7
5,325	87,201	87,385	14.6	1.2	4.4	14.2	0.6	4.9
5,821	11,586	13,641	7.0	1.9	4.5	7.7	1.0	4.6
7,918	2,523	3,369	3.5	0.6	2.5	6.6	0.7	3.1
5,422	1,570	1,874	4.5	3.2	3.6	4.7	2.4	3.4
5,350	157	112	5.1	1.0	2.4	4.0	1.0	2.1
),922	12,488	12,208	3.3	0.7	1.7	3.4	0.7	1.8
5,278	4,627	4,909	2.0	0.4	1.1	2.1	0.4	1.2
9,911[12]	378	496	1.2	0.2	0.9	1.6	0.3	1.2
,519	4,976	6,645	5.4	0.4[7]	1.5	5.4	0.1[7]	1.4
6,262	470,216	484,322	10.6	5.6	7.7	12.4	6.0	8.0
6,382	20,566	21,665	12.9	3.1	5.2	8.8	3.1	5.3
8,074[25]	5,693	5,139	5.9	2.3	4.4	7.9	3.0	4.8
4,495	3,450	4,401	8.4	1.1	1.7	6.2	1.1	1.5
6,567	12,347[26]	12,719[27]	2.5	0.4	1.8	2.7	0.4	1.9
9,905[28]	49,801	58,258	4.1	1.1	2.2	6.7	1.1	2.3
7,693	7,262	8,488	1.8	0.1	1.4	3.4	0.2	1.5
2,410	1,130	1,276	5.3	1.9	3.7	6.4	1.2	3.9
7,623	2,741	3,490	1.7	0.6	0.9	1.5	0.6	0.9
),071	2,336,754	2,629,669	—	—	3.3	—	—	3.4

company are not included in

taxes and/or duties are in-

's 1944 report covered a 5-

ude excise taxes, warehouse

egistrants.

egistrants.

egistrants.

reported figures of 24.2 and 22.6 per cent, but the predominant portion of the company's income is derived from rentals.

19. Net sales of registrants have been adjusted to exclude state and federal excise taxes on gasoline and oil.

20. The majority of registrants in this industry group consider net sales to represent the production value of sugar and/or molasses, etc., reflecting actual sales and/or reasonable estimated realizable value of the currently produced inventory.

21. Totals reflect overstatement arising from inter-company accounting on the part of one registrant and its 75 per cent controlled subsidiary.

22. One registrant's figures in 1944 covered a 7-month interim period.

23. Total for 18 registrants in 1943 and 21 in 1944.

24. One registrant's 1944 report covered a 6-month interim period.

25. In some instances registrants in this industry group consider net sales to represent production revenue.

26. Total for 13 registrants.

27. Total for 14 registrants.

28. Federal excise taxes, when reported, have been excluded from net sales.

NON-STOP PRODUCTION VIA CONVEYORS

It's truly non-stop production at Zenith Radio Corporation, Chicago. Conveyor lines, totaling over 5 miles in length and of several types, are laid out in the form of a giant *U*; the main line follows the *U* pattern, and the many subsidiary or feeder lines are either straight-line or in the form of smaller *U*'s All materials are received and started on their way at one end of the shop; completed radios are shipped from the other.

Unit Costs Cut

With a daily production capacity of more than 12,000 radios in many models and types, engineers and production men decided they would standardize all conveyor lines. *Everything* was to be standardized—conveyors, jigs and fixtures, workbenches, and fabrication sequence. The result—all production schedules reached and exceeded. Unit costs cut. Product quality improved. Employee morale raised and labor turnover lowered.

Conveyors are standardized so that they can be moved from one location to another or spliced into other sections with little difficulty. Jigs and fixtures are quickly adaptable for use on almost any model. Such arrangements have eliminated the necessity for complete equipment change when running a different model. Workbenches have standard wiring and layout, and can be used in any part of the plant. Operators do not need special skill or elaborate training, because their work has been so subdivided that they do but one simple operation.

At the starting end of the final assembly line, thousands of parts are received—bolts, screws, lugs, tubes, wire, condensers, knobs, pointers, speakers, magnets. This department handles many thousands of major parts a day, in addition to many minute parts, which come in gross, box, and barrel lots. Special scales and measuring machines are used to count parts.

Stocked at Night

Incoming materials that survive Zenith tests are stored temporarily in a central stockroom where they are labeled and made ready for production lines. The trip to production is made at night. Parts are placed in special containers at work stations for each operator. When employees arrive, the line assembly benches are ready for an uninterrupted production day.

1 Radio chassis are assembled on long straight lines. At the point shown here chassis are ready for aligning and testing. Sets are re-

moved from jigs and transferred to a power-driven conveyor. The jig is returned to the beginning of the assembly line on a belt-driven conveyor traveling underneath the parts rack or "fruit stand," as it is called by employees.

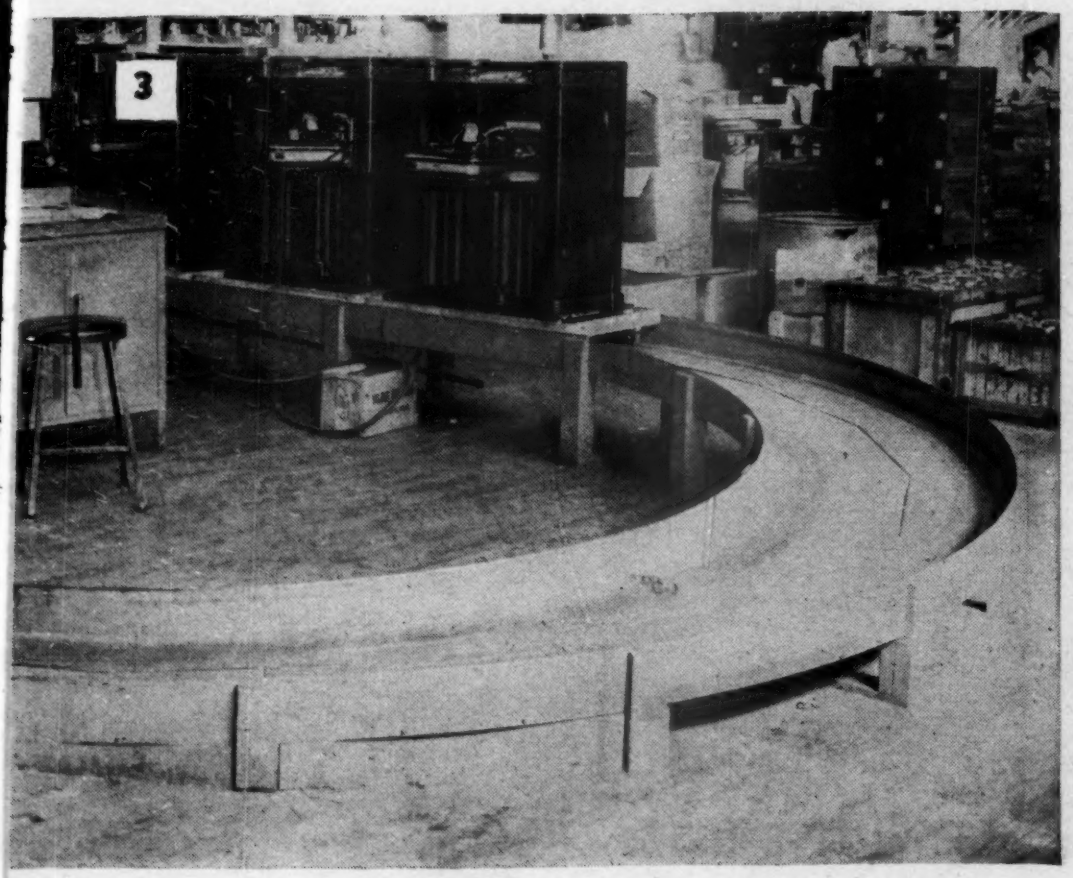
2 Completed chassis are coming off the assembly lines and are flowing into the inspection section on the lowest conveyor line. Here sets are given many functional tests. Completed sets move on the middle of the three conveyors to the end of the line. Rejects on the top conveyor go to the repair department.

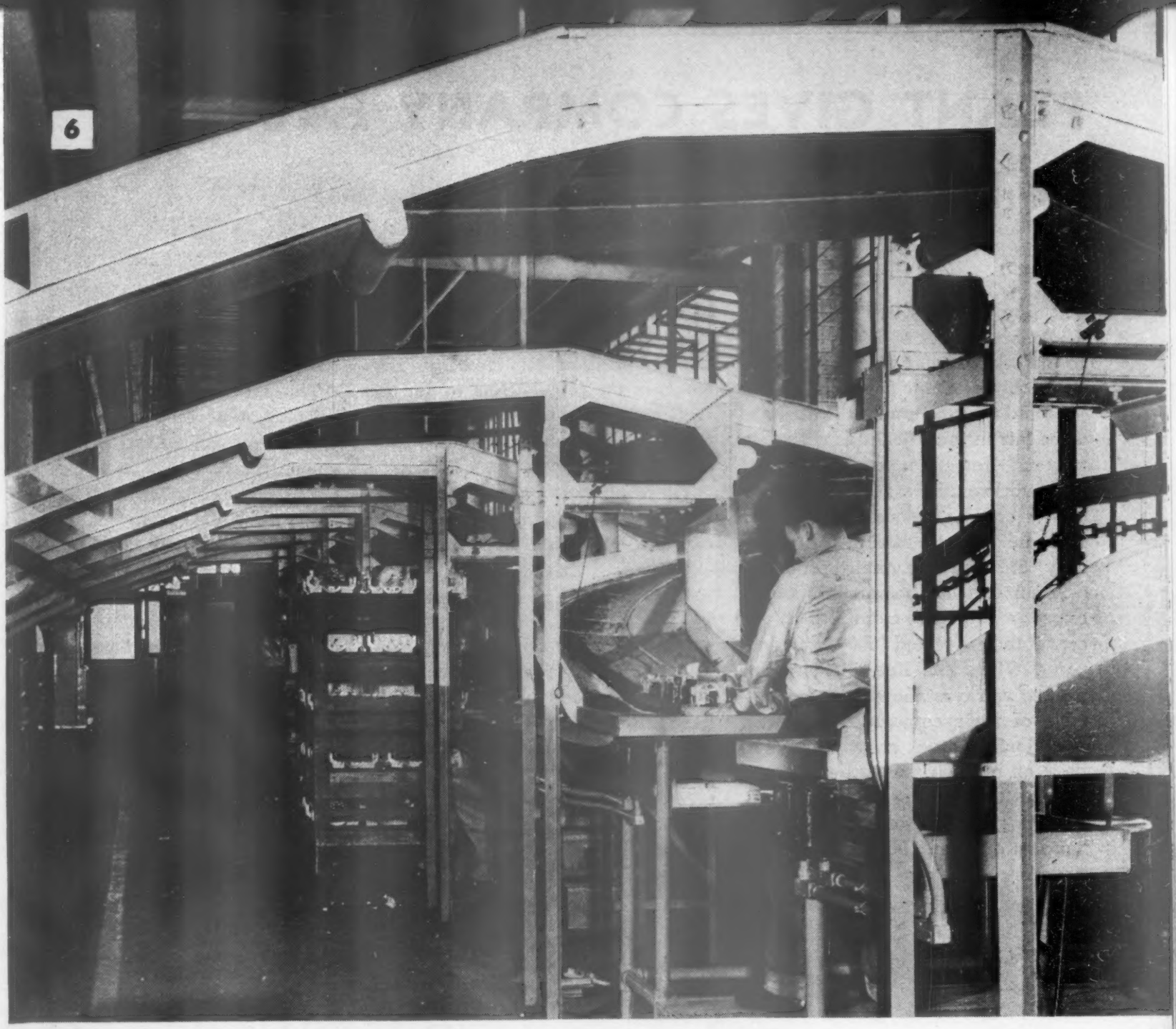
3 Final assembly line of Zenith's console radio is oval in shape. Radio chassis, delivered on overhead "traveling stockroom" conveyor, is assembled into the cabinet together with the record player, antenna, and speaker. Radio is then ready for final testing. Table sets and automobile radios are similarly handled by different types of conveyors, and all completed sets emerge at the end of the huge *U*-shaped production line.

4 When it is necessary to shift sets from one line to another, it is done over this bridge arrangement. Hinges permit the line to be opened like a gate in an emergency.

5 Cabinets and cartons for table model sets are received as a unit from vendor. Cabinets are placed on the conveyor line at right, where final work is done on them. Finished sets move down center conveyor to the packers after the girl at the end of the line has recorded set serial number. Cartons move on top conveyor to the packers, left.

6 Over the aisles on the "scenic railway" goes the electrically tested set. Belt conveyor drops the set into the spiral chute. An inspector makes a final check, records the chassis as completed, and places it on the "traveling stockroom" conveyor for its final ride.

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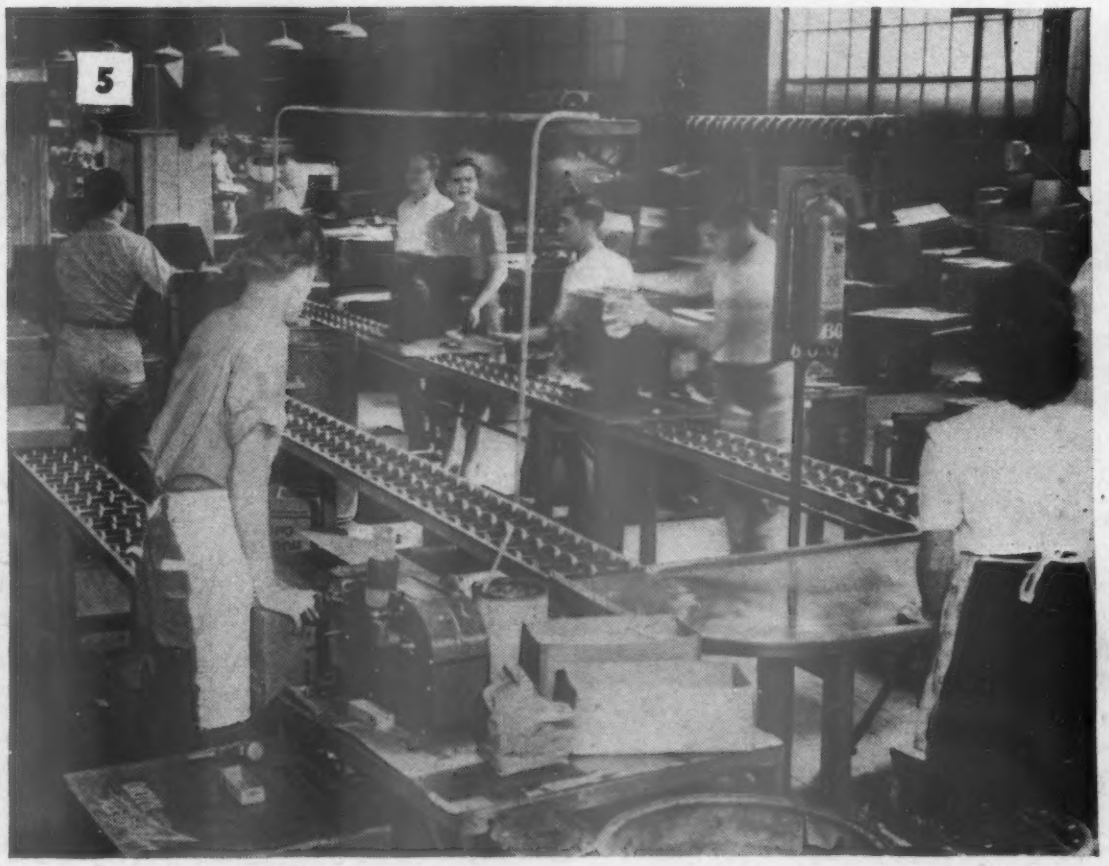
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PLANT GIVES COMPANY FACTS IN LOCAL ADS

It's easy to say, "Give workers the economic facts of life." It's easy to understand that workers need to know the economic facts about their jobs and their companies if they are to be fair in their dealings with employers. For example, three out of four workers think their own companies could give workers a wage increase without raising the prices they charge for their products.

About half of the workers would expect a return of from 5 to 15 per cent if they invested $5000 in a company. With this liberality toward profits, workers show little knowledge of their companies' finances. A majority do not know enough to have an opinion about the share of income that owners and stockholders get. But, of those who do have an opinion, about one-half, 25 per cent of all those interviewed, think the owners get too much.

The question is: *How to give workers the facts? How to get the facts over without preaching, without condescending, without tangling everybody up in statistics?*

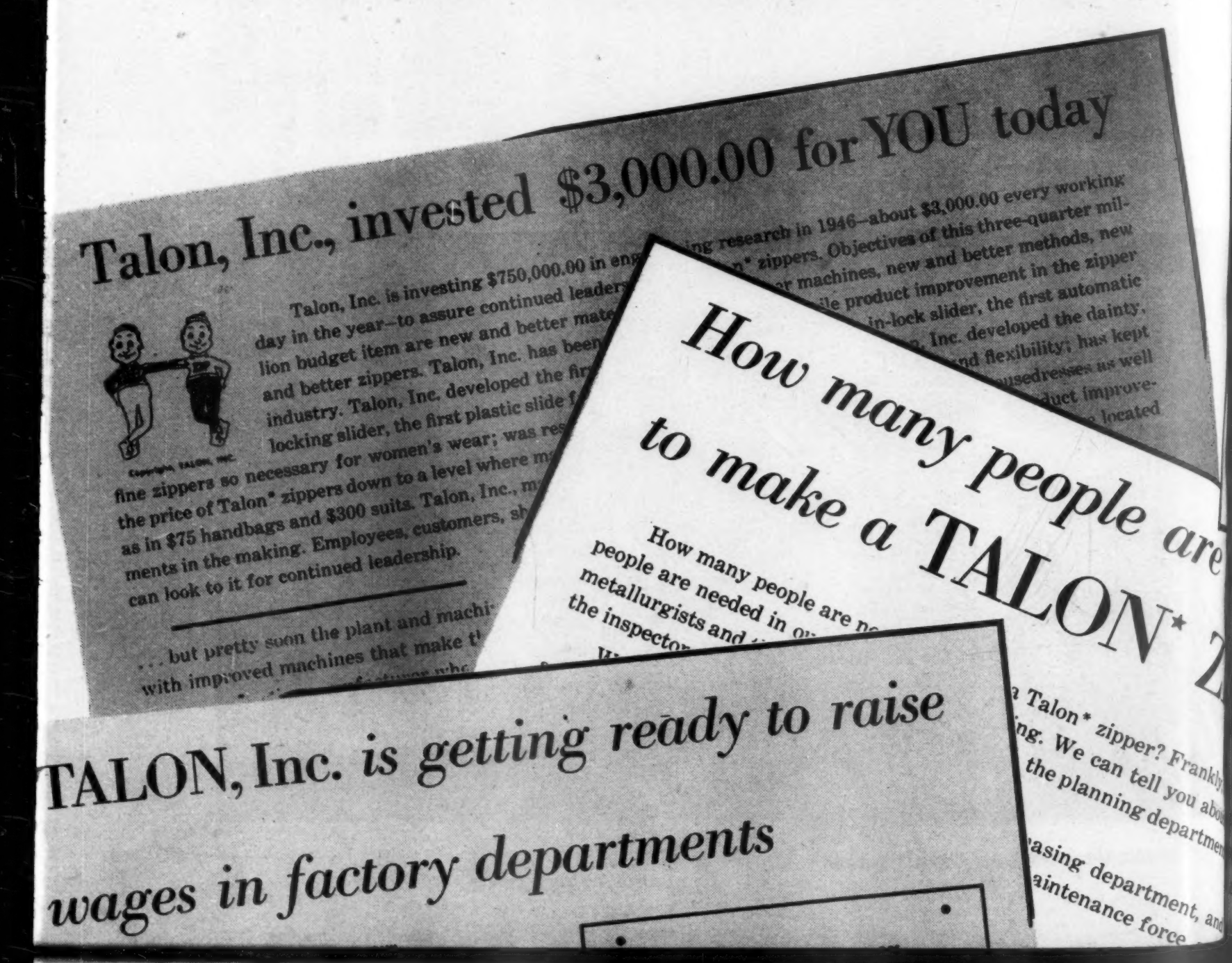
There *are* ways and means. One that every company, big or little, can use is the local newspaper.

Copy That Appeals

Using newspaper advertising, Talon, Inc., is spreading economic education effectively. Reproduced here are portions of a series of full-page advertisements the company has been running in its home plant city, Meadville, Pa. The advertisements have "homey" copy to increase their local appeal. They are written with both employees and their neighbors in mind to strengthen community relations.

The advertisements cover the full range of the company's—and workers'—interests. They tell, among other things, how the idea for zippers originated, how the company developed, why patents are necessary, and how continuing research benefits Talon workers. The advertisements explain how wage rates are set, why quality must be high, why costs must come down, and why the customer is the boss.

Workers cannot help learning from these exhibits (a) what makes jobs, (b) where the money to pay wages comes from, (c) how easy it would be for jobs to disappear, and (d) that employer and employee must cooperate to keep jobs going.


Talon, Inc., invested $3,000.00 for YOU today
Talon, Inc. is investing $750,000.00 in engineering research in 1946—about $3,000.00 every working day in the year—to assure continued leadership in fine zippers so necessary for women's wear; was research to bring the price of Talon* zippers down to a level where many more people could enjoy them, as in $75 handbags and $300 suits. Talon, Inc., machines, new and better methods, new and better zippers. Talon, Inc. has been a leader in the zipper industry. Talon, Inc. developed the first automatic locking slider, the first plastic slider, the first automatic
How many people are needed to make a TALON* Zipper
How many people are needed in our metallurgists and the inspectors
a Talon* zipper? Frankly, ing. We can tell you about the planning department
asing department, and aintenance force
TALON, Inc. is getting ready to raise wages in factory departments

There are just 3 ways to raise wages and 2 of them are bad news to the wage earner

1. YOU CAN TRY TO GET MORE MONEY FOR THE PRODUCT

. . . and run the risk of cutting down on volume of work. A penny increase in the price of Talon* zippers to manufacturers of low-cost merchandise would send many of them to one of our approximately 30 competitors,—or would find them substituting buttons, snaps, clips, or some other form of fastener. When you consider that the low-cost market is the biggest market it's easy to see how an increase in the sales price of a product can turn out to be bad news to the fellow who makes it. Maybe he gets "priced out of business"!

2. YOU CAN STOP PUTTING MONEY BACK INTO THE BUSINESS—AND CUT PAYMENTS TO SHAREHOLDERS

. . . but pretty soon the plant and machinery will wear out, or competitors will come up with improved machines that make the product less expensively, and customers will leave you for the manufacturer who gives him as good a product at a better price. And you wouldn't be able to get new money for plant improvement because investors are not interested in a company that hasn't been paying dividends. So before long there would be fewer and fewer jobs for wage earners.

3. THE ONLY GOOD WAY TO RAISE WAGES IS TO INCREASE PRODUCTION—MORE PRODUCTION MEANS MORE PAY

If everyone at Talon, Inc. produces more, the zippers made will cost less. That means more business—and more money to distribute as wages.

Some people have the idea that wages can be raised by giving the employee a bigger share of what is left after paying for raw materials, packaging, sales and warehousing, taxes and other necessary expenses. In 9 cases out of ten it can't be done, for in most businesses the employees are already getting the biggest share. At Talon, Inc., for instance, wage earners are getting more than 75% of what is left after paying for the cost of doing business.

But if wages can't be raised by giving the worker a bigger share of the total income how are they going to be raised? Mostly by producing bigger incomes. The way Talon, Inc. has done in the past and is doing today. By building a better zipper—yet by keeping the price at a point where Talon* zippers can be used in a $1.95 housedress as well as in a $450 hostess gown; in a 98¢ wallet as well as in a $75 handbag. By providing employees with tools and machines and methods which make their work hours more productive—and better paid. By giving customers greater value. By giving investors a fair return on their investment.

Talon, Inc. believes that no wage is too high—if it is earned. With more money to divide up—as a result of greater production—every worker will get his share.

SCOOP & ZIP, copyright, 1946
*Reg. U. S. Pat. Off.

TALON, INC., MEADVILLE, PENNSYLVANIA

MATERIALS HANDLING ANALYSIS

DIVISION _____ WORKS _____

STUDY OF TANK COVERS

	MATERIAL CHARACTERISTICS				MOVE CHARACTERISTICS							
NE	NAME & DESCRIPTION DESCRIBE IF WET, CRATED, GRANULAR, COMBUSTIBLE, CORROSIVE, FRAGILE, ETC	SIZE	WEIGHT	DESCRIBE CONDITION AND POSITION OF MATERIAL PRIOR TO MOVE	FROM	TO	DISTANCE	QUANTITY PER MOVE	FREQUENCY	QUANTITY YEARLY	IN-SPECTED	
1												
2	COVERS	Av. 16½"x20½"		TRANSFER TO ROLLER CONV.	WORK STA. 15	15	50'	1				
3				ROLLER CONV.	15	20	50'	-				
4				LIFT RACKS TO SKID.	20	20	10'	1				
5				MOVE SKID TO STORE ROOM	20	#12 YARD	175'	1				
6				UNLOAD RACK FROM SKID	#12 YARD	"	100'	1				
				LOAD RACK TO SKID	"	"	10	1				
				TRANSPORT SKID LOAD	"	D-30	1250'	1				
					D-30		1435'					

SOLVE YOUR HANDLING PROBLEMS WITH THESE THREE FORMS

R. W. MALLICK • ASSISTANT TO DIRECTOR, HEADQUARTERS MANUFACTURING DEPARTMENT, WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH

Analysis is the key to materials handling problems. Problems are too often solved by snap judgments. Many of us are too quick to say "That's a job for a lift truck," or "We'll put in a gravity conveyor," and let it go at that. Such a solution is sheer guesswork and may well lead to costly errors.

To help eliminate this kind of decision, the materials handling engineers of the Westinghouse headquarters staff made a study in consultation with equipment makers, and came up with three standard forms valuable in analyzing materials handling problems.

The single-item materials handling questionnaire contains the questions that apply when a single item must be moved. It does not cover every condition, but is sufficiently general in scope to permit the analyst to grasp the complexity of the problem.

The materials handling analysis form is more detailed and is intended to cover a complete analysis. By its use a single item can be followed through an entire sequence of operations. Also any number of items can be charted on this form, resulting in a complete analysis for a plant or product.

One feature of the form that adds to its usefulness is its adaptability to either existing or proposed method studies. This reduces the number of forms needed and the amount of paperwork required.

The composite chart showing the types and classifications of materials handling equipment is referred to after the data have been collected in the analysis. The materials handling engineer can consult the chart and quickly determine what equipment is available for each type of handling operation. If he is familiar with each type, he can proceed to specify his requirements. If not, he can call in suppliers' representatives who deal in the equipment that appears to fill his needs.

COMPILED BY _____

APPROVED BY _____

DATE _____ REVISED _____

SHEET No. 1 OF 1 SHEETS

PROJECT No. 2162

EXISTING ~~OR PROPOSED~~ METHOD (cross out one)

CONTAINER USED AND QUANTITY IN EACH	HANDLING EQUIPMENT USED	CONTAINER DISPOSITION			UNIT LABOR TIME (HOURS)				NO. MEN REQ'D.	HANDLING LABOR COST PER UNIT	REMARKS WAITING TIME CYCLE TIME
		STAY WITH MAT'L	OTHER (DESCRIBE)	LAYDOWN SPACE REQ.	LOAD	TRANSPORT	UNLOAD	TOTAL			REP. NO. PIECES / DIRECT LABOR COST
RACK-50 Pc						.088		.176	2	.1585	50 .0031
" "						OPERATORS TIME			—	—	— —
" "								.176 1.056	2	.9504	300 .0031
" "								.230	1	.2070	300 .0006
" "								.176 1.056	2	.9504	300 .0031
" "								1.056	2	.9504	300 .0031
RACK 5								.230	1	.2070	300 .0006
								.230	1	.2070	300 .000(
								.176	2	.1584	50 .003
								DIRECT LABOR			.0178
					1945	= 125,591 X		$ 01787 =			$2.244.31
											325 80 / 1 02 84
											$2.672.95

SINGLE-ITEM MATERIALS HANDLING QUESTIONNAIRE

DIVISION _____ WORKS _____ COMPILED BY _____

BUILDING No. _____ SECTION No. _____ DATE 7-19-46

STATE PROBLEM AND DESIRED RESULTS BRIEFLY CORES

MATERIAL

Description SPLIT, WOUND CORES BANDED TOGETHER

Size 3"X2½"X5" SMALLEST 2"X7"X13" LARGEST

Weight of Piece 35# AV.

Shape (Furnish Sketch) SEE BELOW

Condition (Wet – Hot – Fragile – Sticky – Fluid – etc.) DRY

Individually Packaged – Kind? No

CONTAINER

Name (Crate – Carton – Totepan – Keg – etc.) TOTE PAN

Size (Outside and Inside) 28" X 17" X 14"

Construction STEEL

Weight (Empty) 30#

Contents (No. Pieces and Weight) 18 P

Disposal (Empty Container) RE

LOGISTICS

Delivered by (Rail – Truck or Others) Sk

Quantity in Each Delivery 12 TOTE P

Frequency of Delivery 21 LOADS D

Distance from (Receiving Point or Setdown) to

Storage Methods and Height (Racks or Floor)

Normal Amount on Hand 1,200,000 C

Normal and Max. Amt. Moved at One Time

Frequency of Move HOURLY

Describe Floor-Type-Capacity and Condition CON

Clear Ceiling Height in Affected Area 14'-6"

Describe Present Handling Equipment and Methods

OVERHEAD CRANE LIFTS TOTE PAN

SKID TO STORES. OVERHEAD CRANE

TOTE PANS. ELEC. TRUCK DELIVE

Remarks OVERHEAD CRANE REMOVE

MATERIALS HANDLING EQUIPMENT CLASSIFICATION AND NOMENCLATURE

← EITHER MOBILE OR FIXED GROUP — MOBILE GR

1 CRANES

SER. No.	TYPE	ITEM
.100	OVERHEAD BRIDGE TRAVELING	.101 POWER, CAB DRIVE .102 MANUAL, CHAIN DR. .103 PUSH TYPE .104 WEIGH LARRY .105 TRAVELING PL'T'M. .106 .107 .108 .109 .110
.200	OVERHEAD BRIDGE NON TRAVELING	.201 .202 .203 .204 .205 .206 .207 .208 .209 .210
.300	GANTRY	.301 PORTAL .302 SEMI-PORTAL .303 PORTABLE .304 FOLDING JIB

2 CONVEYORS

SER. No.	TYPE	ITEM
.100	ROLLER GRAVITY	.101 SPIRAL .102 PORTABLE .103 ROLLER (PLAIN) .104 "V" TROUGH .105 DOUBLE DECK .106 .107 .108 .109 .110
.200	ROLLER LIVE	.201 GEAR .202 CHAIN .203 BELT .204 PUSH BAR .205 MAGNET .206 .207 .208 .209 .210
.300	WHEEL	.301 WHEEL .302 PORTABLE .303 DISK .304 CABLE DRIVE .305 .306

3 TRACTORS &

SER. No.	TYPE	
.100	TRACTOR ROAD	.101 CR .102 RC .103 H .104 T .105 .106 .107 .10 .1
.200	TRAILER ROAD	
.300	TRAC IND	

MUST INDUSTRY TAKE THE RAP FOR HIGH PRICES?

Organized labor has said that industry's prices should go down even though wages go up.

President Truman has said that industry's prices should go down.

Whether they are right or not can be determined by examining certain facts.

By and large, there is little disagreement as to the facts—among those persons who have sought them rather than lazily accepted half-truths and propaganda. There are, however, differences of opinion as to what those facts mean and as to what conclusions to draw from them. Honest differences.

A prime example of both the propaganda and honest differences facing the American people is the now almost magical figure of $12,000,000,000. That was the net, after-taxes profit of all corporations in 1946. No argument from anyone.

According to the *Daily Worker*, $12,000,000,000 is exactly $12,000,000,000 too much. *Propaganda.*

Philip Murray of the CIO and his advisers say it's about $7,000,000,000 too high, that the $5,000,000,000 averaged in 1935-9 is adequate. *Half-truth.* He fails to mention that the national income has increased by over 2½ times since then.

Some industry spokesmen say that the $12,000,000,000 figure includes about $3,500,000,000 of tax refunds and is thereby distorted upward. The implication is that the remaining $8,500,000,000 represents too small a share of the national income. *Half-truth.* They fail to mention crippling strikes in the first part of the year. Profits for the second half were in *excess* of the $12,000,000,000-a-year rate.

The National City Bank of New York reports that 1946 profits for a large and fairly representative group of industrial corporations were, over all, 12.1 per cent of net worth. Similarly, the bank reports the same after-taxes profit represented only 6 per cent of sales. *Which figure is significant,* and what does it indicate? Even with volumes of supplementary material, there is room for an honest difference of opinion on this point.

There is no room for argument that today's cost of living is 50 per cent or more above the level of 1939.

But—what part of the rise is due to industry's prices?

What is industry's present position prices-and-profits-wise? Can industry cut prices? What would be the effect of an industry-wide price cut?

What is keeping prices up?

Only in the answer to the last question will be found the key to the even more important problem—what will bring prices down?

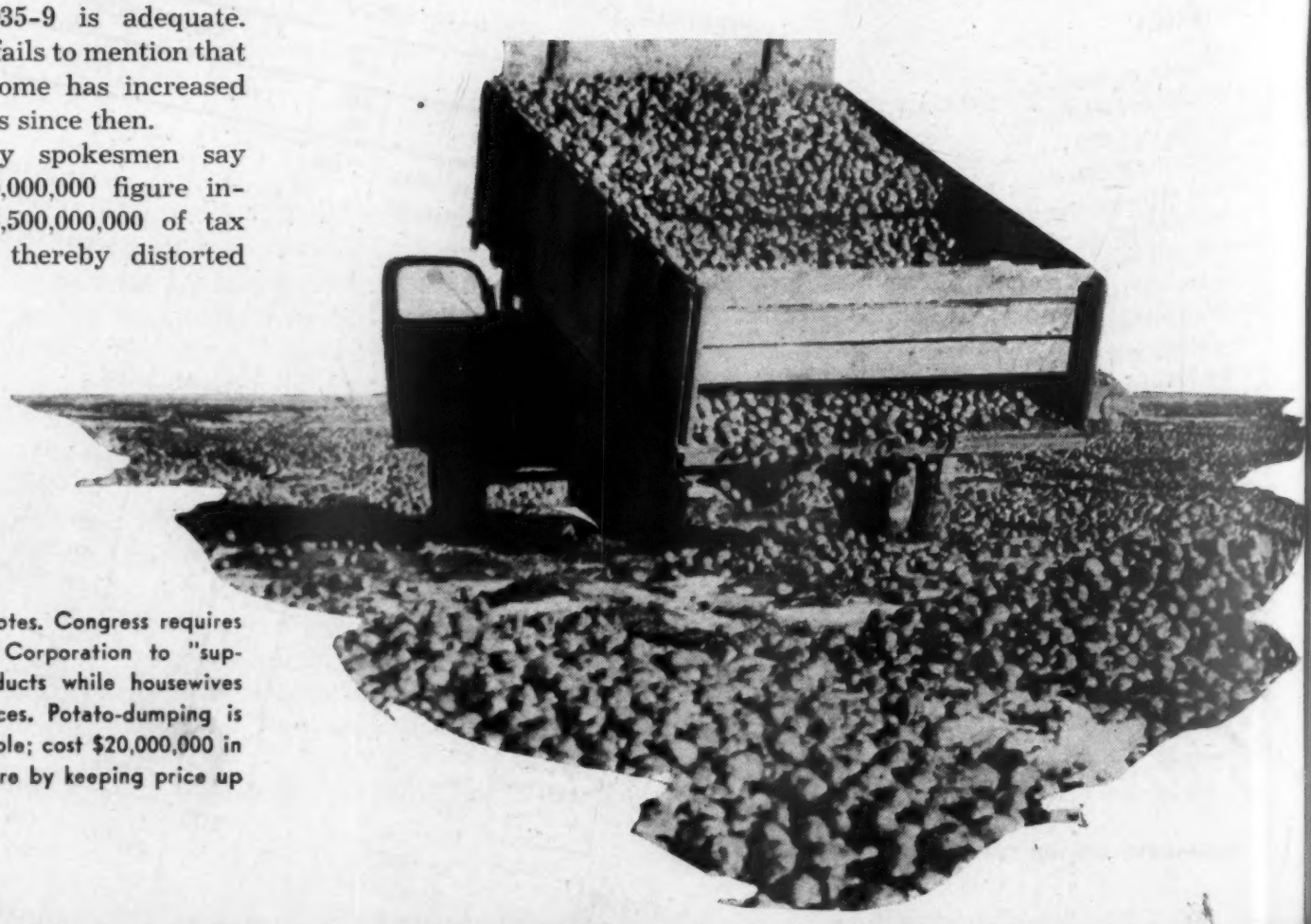
Why Prices Are High

Three factors are responsible for today's high level of prices.

1. *A natural desire on the part of everyone for maximum personal gain.*

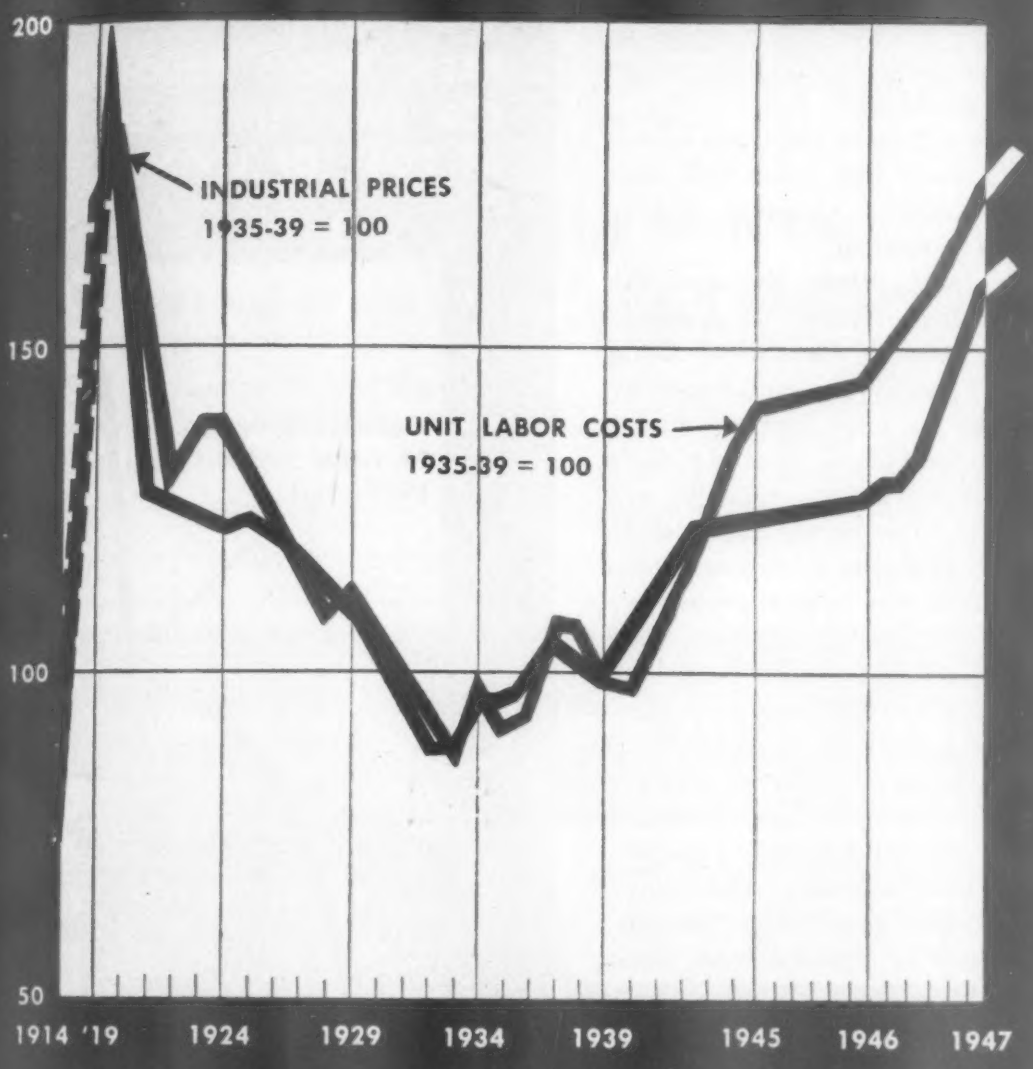
2. *Fear of labor's wage demands and their possible effect upon the cost-price-profit structure.*

3. *The politically built floors which prevent any major break in the disproportionately high prices of farm products.*



The price of farm votes. Congress requires Commodity Credit Corporation to "support" 33 farm products while housewives pay inflationary prices. Potato-dumping is most dramatic example; cost $20,000,000 in tax money, much more by keeping price up

LABOR COSTS HAVE FORCED INDUSTRIAL PRICES UP



Data: Industrial Prices, Bureau of Labor Statistics; Unit Labor Costs through 1941, Department of Commerce; 1942 to date estimated by McGraw-Hill Department of Economics on assumption of no change in labor productivity since 1941

Factor 1

Little need be said in explanation of the fact that everyone has a natural inclination to try to get while the getting is good. Some—not many—manufacturers have made the decision to try for a quick killing regardless of the long-run consequences. Most farmers and workers have decided to take advantage of the current situation by charging all that the traffic will bear.

Factor 2

Labor claims that wage increases can come out of profits without raising prices, and that industry will still have adequate profits. In some cases this may be true, but as a generalization, it is *just plain bunk.* The cost of labor accounts for 65 to 70 per cent of the total cost to the consumer of the items he buys.

Many corporations have recently granted 15-cent wage increases. A few of them have announced price advances, but, up to the present, most have managed to withstand the pressure.

However, a dangerous pattern of reaction is becoming more obvious every day. "Some companies have raised wages without raising prices," goes the argument, "so those that raise prices are profiteering at the expense of the people."

Are they?

The possibility that they are could be eliminated only by exhaustive study of each individual case. Much more likely, however, is one or both of the following explanations:

A. Through unfortunate "timing," these corporations are only now finding it impossible to absorb the higher prices caused by last year's wage increases among their suppliers.

B. In an effort to give their customer more than an even break, these companies trimmed their margins to the danger point by absorbing most of last year's wage hikes. Thus they have no slack left and the new increase must be reflected immediately in order to stay out of the red.

It's politically popular to lambaste anybody who raises prices today. But what a price to pay for political expediency! Some of those being most loudly criticized are the companies that didn't take full advantage of last year's generally rising prices.

A perfectly fair question to ask is, why didn't the companies that have just raised wages cut their prices months ago?

The answer is that the current round of wage increases was inevitable. It could have been forestalled only by a drop in the general price level, and it was not within the power of industry to bring about any such drop. The charts show clearly how small a percentage of the rise in the cost of living is due to the rise in industrial prices.

What, then, would have been the situation if industry had made price cuts equivalent to the recent wage raises? The cost of living index would have gone down a negligible amount, and the pressure for higher wages would have remained. Strikes might have been necessary, but the fact is that organized workers would have forced the 15-cent wage hikes, or something close to them. With no slack available for these rises, price increases would have been immediate all across the board, and the stage would have been set for another round of wage increases on the basis of the price rises.

When a company grants a wage increase, pressure is created for all other companies to do likewise. And when an increase is won from a company that must raise prices to cover the increase, the pressure on other companies is multiplied because the price hike automatically worsens the position of *all* workers.

It can't be that our labor leaders

are too ignorant to realize that price cuts would be of greater benefit to more people than wage raises. Fact of the matter is that the nation's labor leaders lack the degree of statesmanship needed to tell workers the truth about this matter.

Although it is probably circumstance rather than design, there is one final element in the labor picture which tends to increase rather than decrease wage-raise pressure. That is the fact that the first major breaks usually come in the best-paid industries. Steel established this year's pattern by adding $6 a week to average weekly earnings of slightly over $50. The effect upon workers earning about $38 in the cotton goods industry is not hard to imagine. The differential is no longer $12 but $18; the pressure for equalization is at least 50 per cent greater. The labor barons who think only in terms of today are short-changing themselves, the members of their unions, and the entire nation by perpetuating—even increasing—the wage inequalities in the country.

Factor 3

Beside catering to the labor vote, election-conscious federal officials stand in mortal fear—politically—of the farm bloc. It is in this fear that is found the third and final basic reason for today's high cost of living: The politically built floors which prevent any major break in the disproportionately high prices of farm products.

The two largest elements of industry's costs are labor and materials. Labor is sky-high, and is likely to remain so.

High farm prices continue the drive for higher wages by preventing any drop in the cost of living index. Food alone—and this is by no means the only farm product—accounts for 42.5 per cent of today's cost of living index. *Over 67 per cent of the rise in the index since March 1, 1946, has been due exclusively to the rise in food prices.*

Many raw materials come from the farm, and their cost is artificially maintained.

The theory behind the farm price-support bill was that if farmers were to be limited in their income during the war (by OPA), they were entitled to assurance of a high-income level for two years after the war. The theory is equally good when applied to industrial prices. There is just one difference—one is politically practical; the other isn't.

The picture would be bleak enough if the politicians stopped there. But they don't. In perhaps the baldest play for farm votes since the heyday of the NRA, Under-Secretary of Agriculture Dodd told the Senate Agriculture Committee point-blank:

"I would rather have 100 acres of wheat and get a dollar for it than 200 acres and get 50 cents."

So while industry is taking the rap for the high cost of living, the government is preventing any major decline in prices.

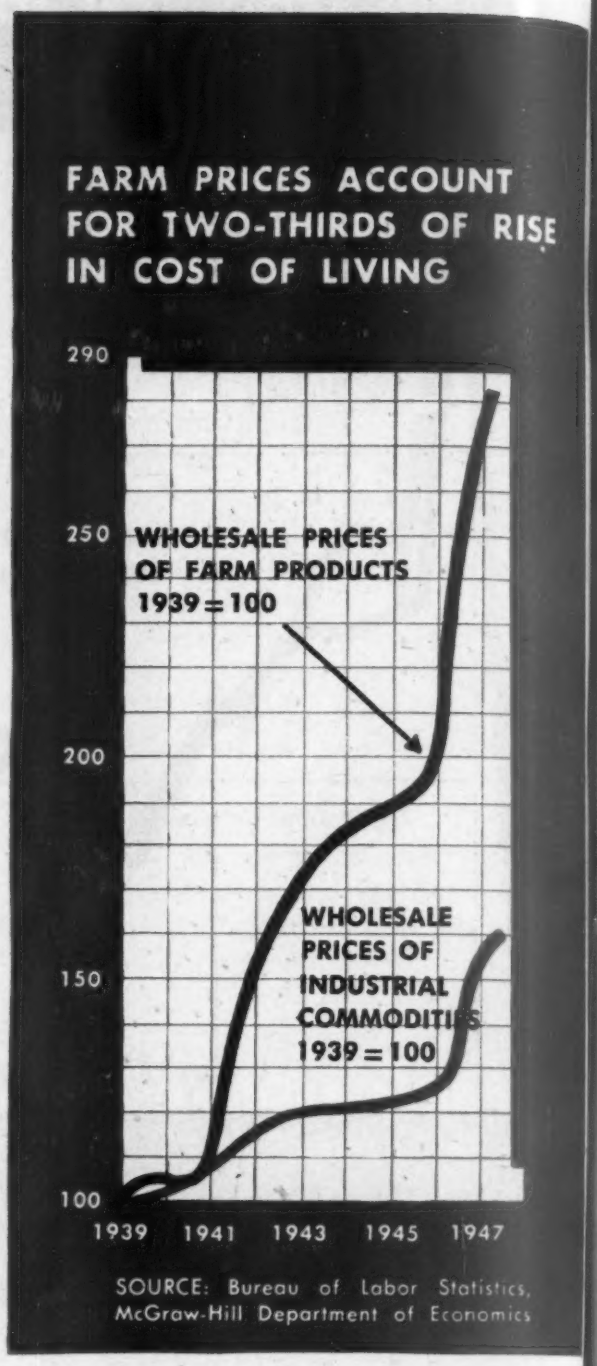
As awareness of the price-support program has grown, an argument, too, has grown as to just exactly what effect the program is having on the price level. Nub of the controversy is this—how can a program which requires support of prices at 90 per cent of parity be blamed for holding up prices that are above that level?

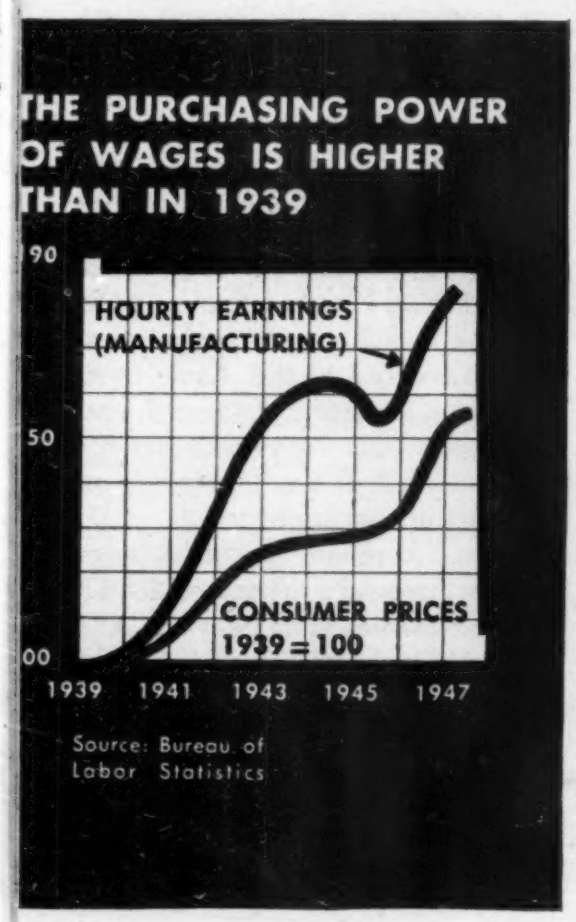
Secretary of Agriculture Anderson gave the answer—it is cheaper for the government to support prices by buying small quantities at above parity prices than to wait for prices to drop to the parity level and then be forced to engage in mass buying with its attendant large losses.

Net effect of this has been that during the past year the Commodity Credit Corporation has supported—"traded" is the official term—33 specific commodities. How many more commodities may have been supported by activities classified as "unallocated" is anybody's guess.

Most of the items "traded" are selling at above the parity price. What Secretary Anderson said is literally true—this is cheaper for the government. *What he did not say is that this procedure is ruinously more expensive for the American people.*

One final point that should not be overlooked in considering the farm price-support program is the *double* inflationary pressure which





it creates. Holding prices up is only half the pressure. The other half stems from the fact that the program costs money. And the more "natural" prices go down, the more it costs.

But—every dollar spent in the support of farm prices must come out of the pockets of the American taxpayers, thereby reducing purchasing power and broadening the inflationary gap between take-home pay and the artificially high prices.

What Industry Must Do

Three major factors are at work on prices today.

1. Labor is holding them up by demanding—and getting—high and higher wages.

2. Government is holding them up by creating artificially high levels of farm prices.

3. The consumer is demanding that prices come down, and is threatening to withhold his patronage to enforce that demand.

There can be no doubt of the final outcome—as always, the consumer will be served.

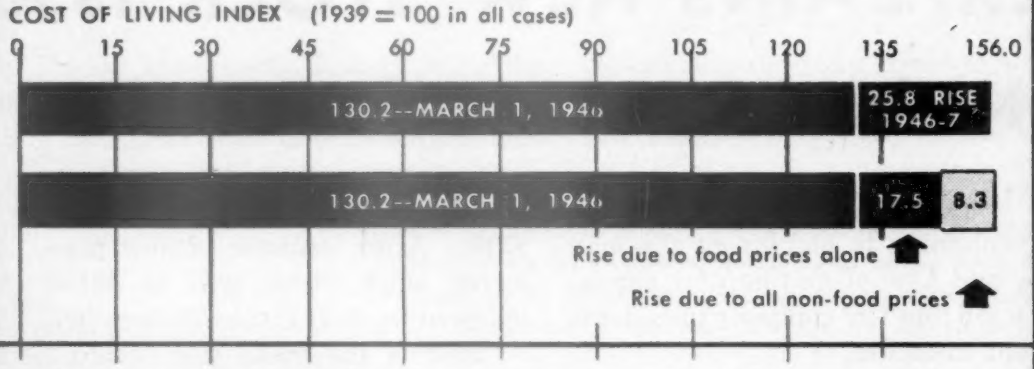
The question is how this end result may be achieved without going through the agony of a major economic upheaval. There are only two sources for price reductions—profits and farm prices. Wages cannot be reduced except by depression.

What about profits? If *all* manufacturers were to *eliminate profits completely,* the total price of the goods they sell would be reduced by only 8 per cent (in 1946, *before* taxes profits were 8 per cent of gross sales). Assuming that the

WHAT WOULD HAPPEN TO THE COST OF LIVING

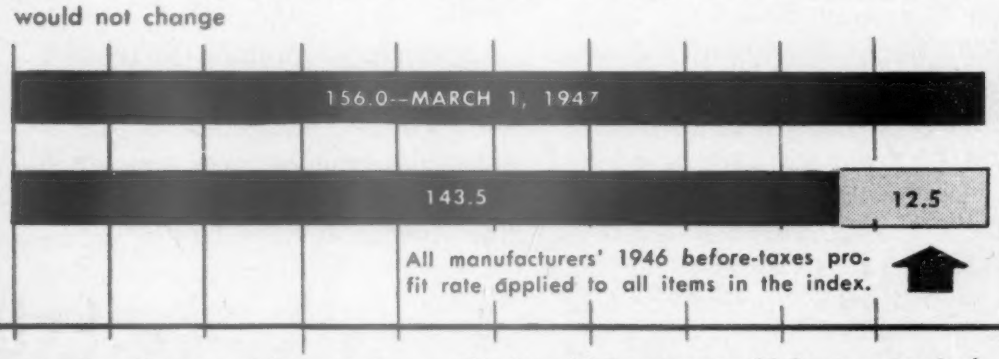
IF all non-food prices were rolled back to OPA levels?

Answer: The cost of living index would drop 8.3 points or 5.3 per cent



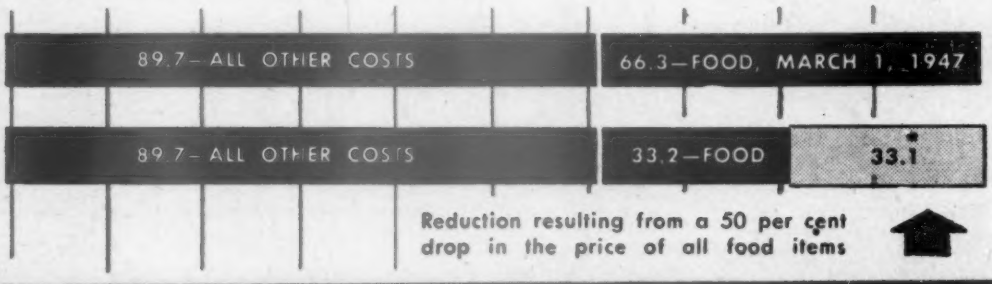
IF all manufacturers' profits were completely eliminated?

Answer: The cost of living index would drop a maximum of 12.5 points, or 8 per cent. Actual drop would be far less since the many non-manufactured items would not change



IF prices of food and farm products were to drop 50 per cent?

Answer: The cost of living index would drop 33.1 points, or 21.2 per cent. And the resulting drop in the cost of agricultural raw materials for industry would soon bring a reduction in many other products


89.7—ALL OTHER COSTS
66.3—FOOD, MARCH 1, 1947
89.7—ALL OTHER COSTS
33.2—FOOD
33.1
Reduction resulting from a 50 per cent drop in the price of all food items

Data:
Bureau of Labor Statistics
Department of Commerce

cost of living index is composed of manufactured items alone (which it is not), the net reduction in the index would be only 8 per cent.

And farm prices —what would be the effect of a drop there? Farm income last year was $14,900,000,000. The 1935-39 average was $4,400,000,000, and the high for that period was $5,100,000,000 in 1937. Farm prices could drop 50 per cent and still leave the farmers with almost twice their total pre-war income.

Such a drop in farm prices would bring the cost of living index down 33 points, or over 21 per cent.

Somewhat slower in appearing, but none-the-less important, would be cuts in industrial prices made possible by the lower cost of raw materials, many of which are farm products.

A third, and indirect, result of such a drop in farm prices would be a lessening of the pressure on labor leaders to get increases for their members at any cost.

But, as of the present time, any such decline in farm prices is *legally impossible.*

Manufacturers, therefore, have three things to do:

1. Clean house. Some companies *can* cut prices. Those that can should and must.

2. Tell workers and the public the facts. Show them that prices are being held up by price supports on farm products—supports which are a calculated attempt to buy farm votes and to discredit business.

3. Join with workers, suppliers, consumers, and anyone else with a vote to bring about repeal of the inflationary farm price-support program.

Careful analysis *proves* that the only successful attack that can be made against today's high prices and high cost of living must have as its prime objective a major reduction in farm prices. *Nothing else will do the job.*

Industry must not take the rap for high prices!

EXPLAINS NEW STOCK ISSUE IN QUARTERLY LETTER

Explaining to employees the *why and how* of getting new capital is a job that few company presidents want to tackle.

This is how W. H. Wheeler, Jr., president of Pitney-Bowes Postage Meter Company, Stamford, Conn., did it in his quarterly letter to employees. To quote Wheeler in part:

"Since the war, we have obtained $2,000,000 from the sale of bonds, and now we have need for about $2,250,000 more. This makes a total of $4,250,000 . . . an increase of about 121 per cent since before the war.

Employment Up

"At the same time, our employment has increased 83 per cent from a pre-war 1215 to a present 2223—an all-time record payroll. It well illustrates the need for capital to make more and better jobs in a growing business.

"To put it another way—the amount of capital invested in each employee's job before the war was $2900. After issuance of new preferred stock, there will be $3550 invested in each Pitney-Bowes job.

"That is the stake that 'capital' has in each of us—and the stake that each of us has in 'capital.'

"The convertible preferred stock . . . which we propose to issue if stockholders approve, is a type of stock which is entitled to dividends *before* the common stock and which does not have some of the risk which common stock has.

"'*Convertible*' simply means that whoever buys the preferred stock will have the right to 'convert' or exchange it at any time into common stock at a price to be determined by the directors before preferred stock is actually offered for sale. This is at a price usually somewhat above the existing market price of the common stock.

"This is a very common method of financing today, economical for companies like ours whose record and future prospects are good.

"Our present common stockholders will be given the first right to buy the new preferred stock. Whatever they do not buy, during a period of about two weeks, will be purchased from us by investment bankers, or 'underwriters,' who in turn will sell it to the public.

Details on Request

"Before offering the stock, we must secure our stockholders' approval, and we must register it with the Securities & Exchange Commission. . . . All in all, it is quite a job. If any of you are interested in further details, we should be glad to send you all the material going to stockholders.

"I thought you might be interested at least in this general outline, as it shows the natural and profitable partnership of labor and capital—and in a way that is close to home. Neither can function without the other, and the healthy and profitable operation of a company like ours is a 'must' for both."

ONE GIRL KEEPS PERSONNEL RECORDS OF 900 EMPLOYEES

R. D. McMILLEN • PERSONNEL DIRECTOR, PARKER APPLIANCE COMPANY, CLEVELAND

Eighteen forms to keep track of employees sounds like a lot of paperwork. In actual practice Parker Appliance, which has that many forms, has found its system so simple that one girl can keep all the personnel records of more than 900 workers. There is a form to cover every situation, a place for every piece of information about every worker, so that any question regarding personnel can be answered speedily and accurately.

Before Employment

1 Application. Like almost every other application form, Parker's requires information about the worker—his name, age, place of birth, names of his parents, his marital status, his former jobs, his schooling, and personal references. If the applicant is not hired, the form is kept on file for 6 months, then discarded. When the worker is accepted, his application form is kept in a personal history file, and it supplies the information for the other preemployment forms.

2 Destination card. Filled out by the interviewer at the time of hiring. It goes with the time card, and is given to the department foreman. Thus the foreman has a temporary record of the employee, which serves until the permanent record is sent to him.

3 Time card. Made out by the personnel department and left at the gate for the new employee, who rings it in, and puts it in the time card rack.

4 Tax card. The mandatory card, authorizing tax deductions. Made out by the interviewer at the time of hiring, and forwarded by him to the payroll department.

5 Insurance card. Likewise made out at the time of hiring and sent to the payroll department.

6 Payroll rate card. Executed by the personnel department and sent to the payroll department, as a permanent payroll record.

7 Job rate card. Kept on file in the personnel department by job classification and rate. Used to make reports and to determine quickly the number of people at a given

One of the 18 forms used by Parker Appliance personnel department. Here the disgruntled worker states his grievance, gets it signed by his union representative and his foreman, turns it in. Disposition of the case is noted on the same form

GRIEVANCE FORM
THE PARKER APPLIANCE COMPANY

Name Smith, John No. 15402 Date 2-14 19 47
Job Screw Machine Operator Rate 1.00 Dept. 1213
Grievance Believe I deserve a .05 wage increase for amount of work I am doing.
Remarks
Foreman's Signature
Employee's Signature Shift 1st shift
Committeeman's Signature

For Office Use Only

Disposition Rejected Date Received 2-15 19 47 Date Settled 2-17 19 47
Remarks: Production is low. Does not deserve raise at present time.

Signature of Union Representative

The Parker Appliance Company

rate in a given job. Buff-colored cards are used for male employees, white cards for women.

During Employment

8 Visible index cards. Duplicate sets of cards are made out for each employee—three cards to a set. One set stays in the personnel department, where it is filed by department and then alphabetically by employee's name; the other is sent to the department where the employee is to work. In this way each department has a permanent record of all persons with whom it is charged. When a worker is transferred from one department to another, his record goes to the new department.

The first of this set of three cards contains the information that appears on the original application, plus the latest available photograph of the employee.

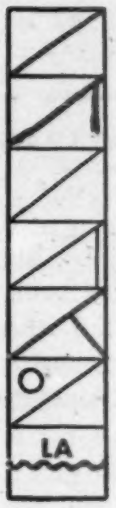
The second card gives the name, starting date, job classification, record of rejected grievances (in blue), warnings received (in red), years of service (heavy black line), and rating record. A green slide shows a starting date between 1930 and 1939, whereas an orange slide denotes a starting date between 1940 and 1949.

On the third card is all the information needed to complete the employee's history—including his ratings, accidents, employment, warnings, and grievances.

9 Index cards. Filed alphabetically on a vertical visible index rack in the personnel department. Cards carry name, address, sex, telephone number, clock number, department, and shift, of the worker. This file is used to locate quickly any person in the employ of the company.

10 Dispensary record. Reports received from the dispensary are used to fill out the dispensary record, which is kept in the employee's personal history folder. It tells at a glance the number of times a person has reported to the dispensary, the reason, and the treatment given.

11 Attendance cards. Individual attendance records are kept for every worker. Information is received from the timekeeping department and is posted daily to buff-colored cards for male and white cards for female employees. The following code is used:



Absent

Absent – reported reason for absence

Tardy

Tardy – reported reason for tardiness

Absent half a day

Did not ring in

Leave of absence

On the actual cards absences are marked with a red pencil, tardiness with blue.

12 Notification of absence. Employees are required to call in and notify the company, giving the reason, when they are absent or late. When the personnel department gets the call, the worker's foreman is told. If the foreman receives the call, he informs the personnel department. This information is noted on the attendance record.

13 Reply card for absentees. If the worker has not reported the reason for his absence for three days, and he cannot be reached in any other way, a business reply card is mailed to him. All he has to do is fill out the card and return it to the company.

14 Warning notice. Originated in triplicate in the employee's department, the warning notice lists any defects that have been noted in the employee's work, attendance, or general behavior, on which he is expected to take corrective action. One copy is kept by the departmental foreman, who distributes the other two to the employee and the personnel department.

15 Change of status notice. Also originated in the worker's department. He is required to report any changes occurring in the personal information initially filled in on his application form. In addition to this information, the foreman also reports changes in rates, departments, classifications, and shifts, as well as leaves of absence. The form is made out in quintuplicate. Each copy carries the name of the department or individual who is to receive it. This change of status form is the only authority the payroll department has to change rates or classifications. All changes must be approved by the personnel director.

16 Grievance form. Made out by the worker, in duplicate, and signed by him, his union representative, and his foreman. One copy becomes the property of the union, one is forwarded to the personnel department. If the grievance is rejected, the union's duplicate is sent to the personnel department to be entered on the records, after which it is returned to the union. If a grievance is for a rate increase that is subsequently granted, the form must be attached to the change of status notice. All grievances, rejected or granted, must contain a reason for the decision.

On Separation

17 Termination form. When an employee is to be separated, his department originates an employment termination card, in triplicate. This form must be checked by the head of the tool control department to make certain that the worker has not neglected to return any gages or other tools with which he may be charged; by the accounting department to assure that he is not indebted to the company in any manner; and by the plant patrol to make certain that all identification badges have been returned. It is then sent to the personnel director for his approval. One copy goes to the payroll department, where the time card is pulled and the terminated employee's final check is made out. The termination form is the only authorization that the payroll department has to make out this check.

18 Clearance card. A clearance card signed by the uniform-room clerk, the toolcrib attendant, and the departmental foreman must be turned in to the personnel department by the employee before he gets his final check, which the payroll department sends to personnel. This card shows that all company property has been turned in.

PLANT LIGHTING

HARRIS REINHARDT

MANAGER, COMMERCIAL ENGINEERING DEPARTMENT
LIGHTING PRODUCTS DIVISION
SYLVANIA ELECTRIC PRODUCTS, INC., SALEM, MASS.

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WHAT IS GOOD LIGHTING?

Lighting is simply a means to an end. When an industrial plant purchases lighting it is really purchasing conditions that make good seeing possible. Therefore, the question, "Why good lighting?" could well be reworded to read, "Why good seeing?" The answer to this question is not hard to find. Consider, for instance, the problems that would result if it were necessary to operate an industrial plant in the dark.

Under such conditions production would be impossible in most types of industrial operations. If it were attempted, spoilage would be at a maximum and quality at a minimum. Accidents would be numerous and serious.

The difference between poor lighting and good lighting is not so dramatically evident as the difference between light and darkness, but it is really just a matter of degree. The plant that does not provide good lighting is failing to provide one of the essential conditions for most efficient operation.

The benefits that may be expected from good lighting, and hence from good seeing, in industry are summarized in Figure 1. There have been frequent attempts to evaluate the benefits of good illumination in such terms as the percentage increase in production, the percentage decrease in accidents, and so on. Anyone who is familiar with plant operation has but to reflect for a few moments on the problems involved in obtaining such figures to realize that they can at best give only a rough approximation of the true conditions, because there are always numerous other factors that cannot be kept completely under control while such data are being gathered. There can be no question, however, regarding the value of good seeing to increased plant efficiency, nor can there be any question that seeing conditions can be improved by a well-designed lighting system.

The lighting of any industrial operation must be considered in relation to the visual task to be performed. The objective in all industrial lighting installations is to improve the ease and accuracy of seeing, and frequently the satisfactory attainment of these objectives calls for changes in the task or its surroundings, as well as in the lighting. Two of the most important factors to be observed in the task are (1) the size of the critical details that must be seen, and (2) the brightness contrast between these details and their surroundings.

The importance of the size and the critical details to be seen is obvious. The worker who must see small parts of a watch or small elements of the grid of a radio tube, for example, requires especially good lighting. This factor usually is fixed by the nature of the work.

The brightness contrast within the work and between the work and its surroundings is less frequently recognized as an important factor in seeing. The importance of this subject can hardly be overemphasized, however, and an understanding of it frequently makes possible changes in the contrast conditions that are absolutely essential before good seeing conditions can be provided.

For many years emphasis was almost entirely

FIGURE 1

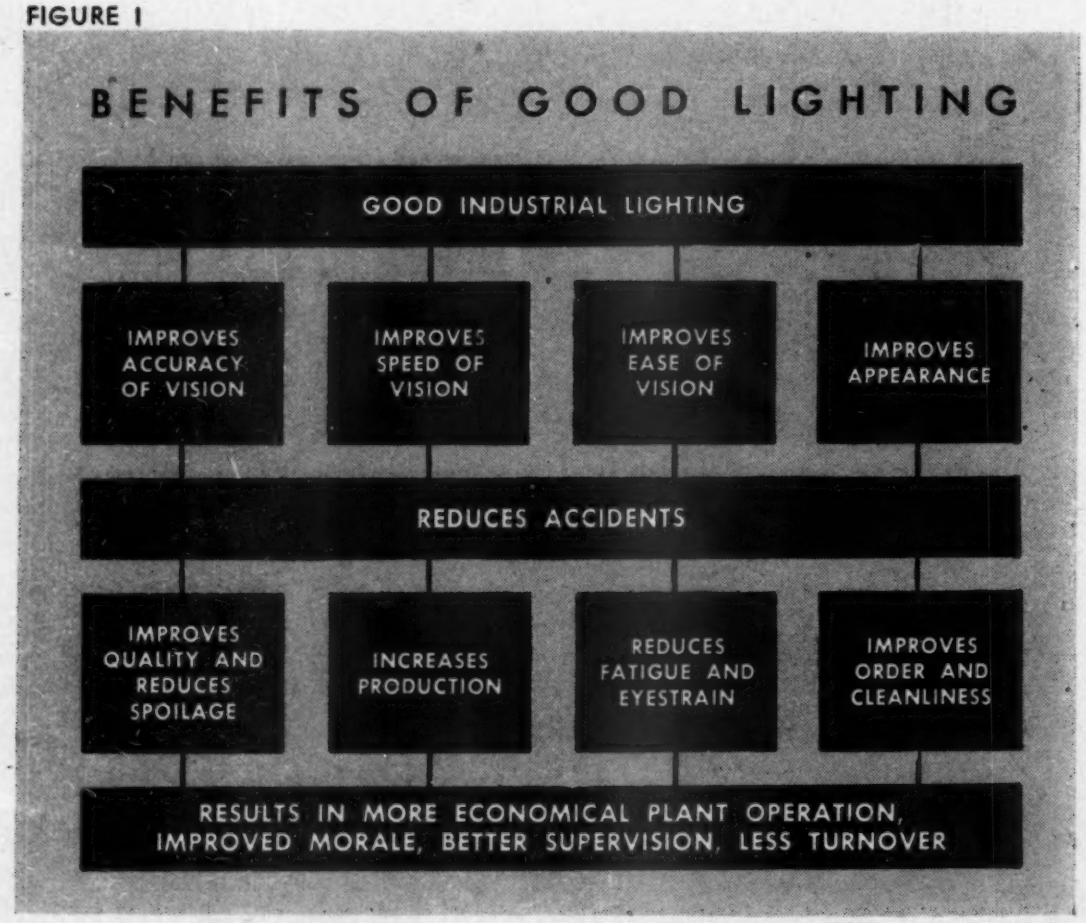
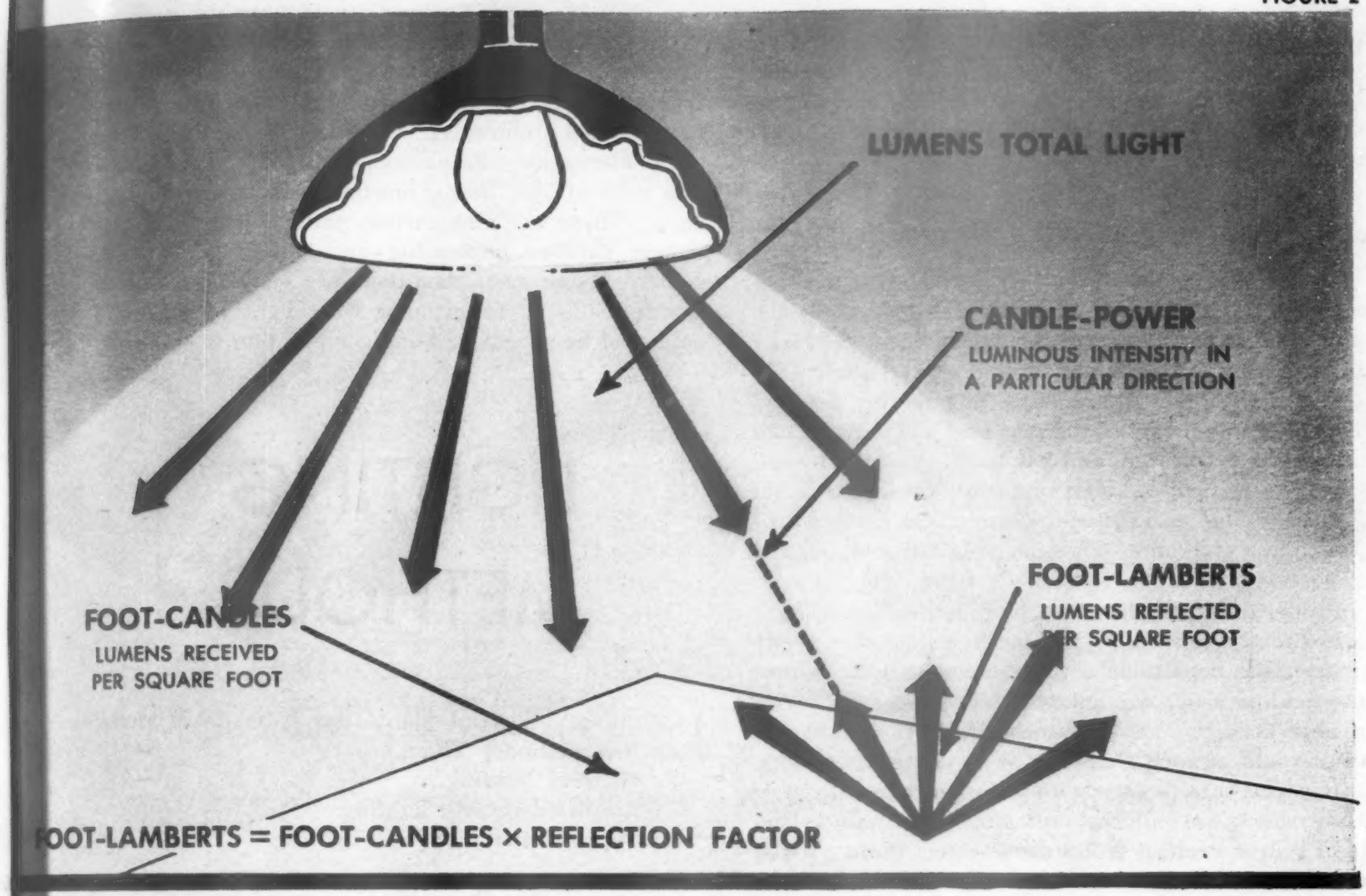

BENEFITS OF GOOD LIGHTING
GOOD INDUSTRIAL LIGHTING
IMPROVES ACCURACY OF VISION
IMPROVES SPEED OF VISION
IMPROVES EASE OF VISION
IMPROVES APPEARANCE
REDUCES ACCIDENTS
IMPROVES QUALITY AND REDUCES SPOILAGE
INCREASES PRODUCTION
REDUCES FATIGUE AND EYESTRAIN
IMPROVES ORDER AND CLEANLINESS
RESULTS IN MORE ECONOMICAL PLANT OPERATION, IMPROVED MORALE, BETTER SUPERVISION, LESS TURNOVER

FIGURE 2



Light reflected to the eye, or brightness, is what the eye actually sees. This sketch shows how the unit used to measure brightness, the foot-lambert, is related to the foot-candle, and how foot-candles are related to lumens, the unit used to measure the total light from a light source. Good seeing conditions demand the proper foot-candle level and proper brightness contrast

on candle-power, which is a characteristic of the light source (see Figure 2). Later emphasis shifted to foot-candles, which are a measure of the light falling on the work. At the present time emphasis is shifting to brightness, which is a measure of the light reflected to the eye and hence of the thing the eye actually sees. Thus, in reading a book the white background acquires a certain brightness because of the light that it reflects to the eye. The black type, on the other hand, reflects much less light, which produces a condition of brightness contrast between the black type and the white background which makes vision possible. The high order of brightness contrast thus produced makes seeing easy and accurate under good illumination.

In many industrial operations, unfortunately, conditions of low brightness contrast (Figure 3) between the work and its background are encountered.

Here a distinction must be made between brightness contrasts within the task itself and brightness contrasts between the task and its immediate surroundings. In assembling the grid of a radio tube, for example, the visual task is the grid structure, and the immediate surroundings are the square foot or so of bench that forms the background.

In drilling a large casting the task is the drill and the hole, while the immediate surroundings are the casting itself.

Within the task itself high contrast also is desirable. Thus, the visibility of the wires that constitute the grid of the radio tube may be greatly improved by providing a small white background against which they can be seen in silhouette. In many instances, however, the contrast conditions within the task are fixed, as in the case of drilling a casting, or when sewing with black thread on black cloth. Such tasks, because of their low contrast, require correspondingly higher levels of illumination.

The important point in this connection is that contrast within the task aids vision whereas contrast outside the task hinders vision. For best seeing conditions the brightness of the task and its immediate surroundings should be approximately equal. Even if the task is two or three times as bright as the immediate surroundings, the conditions from this aspect would still be classified as excellent.

The most undesirable condition results when the immediate surroundings are brighter than the task. This condition may be thought of as a form of glare. The evils of such a condition may not be immediately evident but they are certain to result in impaired vision and eye fatigue for anyone who must work under them for any period of time.

There is no simple instrument or procedure that will automatically distinguish between good and bad lighting. Light meters are a help but they tell only part of the story, because good lighting is made up of a

combination of many factors and it is impossible to place a quantitative evaluation on all of them. One way to describe good lighting is to list, on the one hand, the things that should be attained, and on the other, the things that must be avoided if these characteristics are attained.

An Adequate Level of Illumination

Tables giving the levels of illumination recommended for a number of industrial operations are published in the American Recommended Practice of Industrial Lighting, which was prepared under the sponsorship of the Illuminating Engineering Society. This publication carries the approval of the American Standards Association and has been reprinted by the U. S. Department of Labor under the title, "Industrial Hygiene and Plant Efficiency Through Good Lighting." The values given in the tables are briefly summarized in Figure 4.

Proper diffusion, direction, and distribution of light are directly related to the problems of preventing undesirable conditions of brightness contrast within the field of view, and annoying shadows. An undesirable condition of brightness contrast within the visual field of such character as to cause discomfort, annoyance, interference with vision, or eye fatigue, is known as glare. If the annoying brightness is the light source itself, it is known as direct glare. If the annoying brightness is due to reflection of the light source on polished surfaces, it is known as reflected glare. Careful attention should be given to the avoidance of glare, not only by properly shielding the light sources, but also by providing light that is properly diffused, directed, and distributed in order to eliminate so far as possible undesirable reflecting surfaces in the visual field.

The color of light becomes an important factor when the nature of the work is such that color discrimination or color matching is required. In such instances the services of a lighting expert usually are required to insure the proper selection and use of the lighting equipment. In applications where color discrimination is not a factor, the color of light is largely a matter of individual preferences.

Female workers, for example, will react unfavorably to a color of light that is detrimental to their appearance. There are also certain paint colors that may appear cold or unpleasing under lights of certain colors. When such conditions are encountered it is worth while to experiment with light of different colors, to be sure a pleasing combination is obtained.

FIGURE 3

Here improper location of lighting equipment results in insufficient light on the work. The high brightness of the face of the scale and the white background produce excessive brightness contrast

LIGHTING METHODS

In lighting industrial plants use is made of three distinct methods. These are:

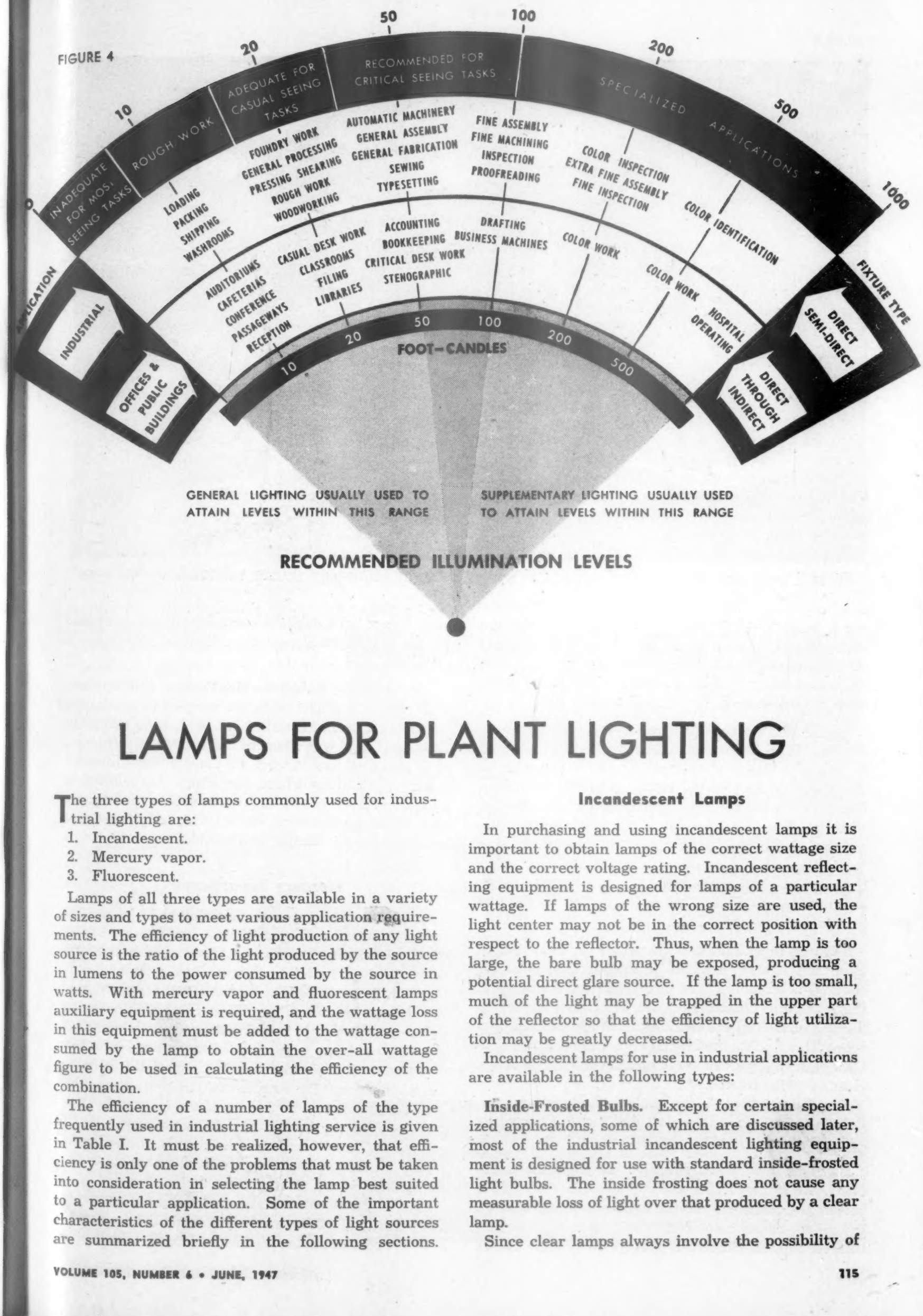
1. General lighting.
2. Localized general lighting.
3. Supplementary or local lighting.

General Lighting. In a general lighting system a substantially uniform level of illumination is provided throughout the entire work area by means of reflectors spaced symmetrically throughout the area, or by continuous rows of units (Figure 5) symmetrically spaced throughout the area.

Localized General Lighting. In localized general lighting systems the reflectors are mounted in definite relationship to the machines or work areas in order to provide the higher levels of illumination at the points where it is most needed. The location of the units is usually such, however, that sufficient light is provided in the remaining areas such as aisles and passageways between machines. This type of lighting would be used, for example, in an area where a general lighting system might fail to produce the desired distribution of light with respect to the machines.

Supplementary or Local Lighting. In local or supplementary lighting the light from a general system of the type previously described is supplemented at important work areas by local reflectors designed to supply a high level of illumination over a small space. In early industrial lighting applications local lighting, frequently by a bare incandescent lamp, constituted the complete system. Glare from the bare bulbs soon established the necessity for shielding all light sources as one of the first principles of good lighting practice. The results were islands or spots of light that produced undesirable conditions of brightness contrast.

To avoid this condition local lighting never should be used alone, but should be employed to supplement the general lighting system at points where higher levels of illumination are needed for critical seeing.



RECOMMENDED ILLUMINATION LEVELS

LAMPS FOR PLANT LIGHTING

The three types of lamps commonly used for industrial lighting are:

1. Incandescent.
2. Mercury vapor.
3. Fluorescent.

Lamps of all three types are available in a variety of sizes and types to meet various application requirements. The efficiency of light production of any light source is the ratio of the light produced by the source in lumens to the power consumed by the source in watts. With mercury vapor and fluorescent lamps auxiliary equipment is required, and the wattage loss in this equipment must be added to the wattage consumed by the lamp to obtain the over-all wattage figure to be used in calculating the efficiency of the combination.

The efficiency of a number of lamps of the type frequently used in industrial lighting service is given in Table I. It must be realized, however, that efficiency is only one of the problems that must be taken into consideration in selecting the lamp best suited to a particular application. Some of the important characteristics of the different types of light sources are summarized briefly in the following sections.

Incandescent Lamps

In purchasing and using incandescent lamps it is important to obtain lamps of the correct wattage size and the correct voltage rating. Incandescent reflecting equipment is designed for lamps of a particular wattage. If lamps of the wrong size are used, the light center may not be in the correct position with respect to the reflector. Thus, when the lamp is too large, the bare bulb may be exposed, producing a potential direct glare source. If the lamp is too small, much of the light may be trapped in the upper part of the reflector so that the efficiency of light utilization may be greatly decreased.

Incandescent lamps for use in industrial applications are available in the following types:

Inside-Frosted Bulbs. Except for certain specialized applications, some of which are discussed later, most of the industrial incandescent lighting equipment is designed for use with standard inside-frosted light bulbs. The inside frosting does not cause any measurable loss of light over that produced by a clear lamp.

Since clear lamps always involve the possibility of

FIGURE 5

GENERAL LIGHTING OF AN INDUSTRIAL AREA BY MEANS OF UNITS UNIFORMLY SPACED THROUGHOUT THE AREA

much more serious glare, inside-frosted lamps are preferable for most applications. The inside frosting diffuses the light to some extent so that it is free from the striations and streaks sometimes observed when bare lamps are used.

Inside White-Bowl Lamps. The standard incandescent RLM dome reflector was originally designed for use with inside white-bowl lamps. In these lamps the lower portion of the bowl up to the maximum diameter is coated on the inside with a white diffusing material that greatly reduces the brightness of the portion of the bulb most likely to be visible. This coating causes a slight loss in the total light output of the lamp but, in the applications for which these lamps are intended, this loss is more than offset by the improved quality of the light.

Silvered-Bowl Lamps. There are certain types of industrial lighting equipment that are designed for silvered-bowl lamps. The bowls of these lamps up to the maximum diameter have a permanent silver reflecting surface on the outside, which is protected by a copper film and covered by an aluminum coating. The neck of the bulb above the silvered bowl may be either clear or inside frosted.

For indirect lighting applications the inside-frosted bulb is to be preferred since it will not cause streaks and striations of light on the ceiling.

Daylight Incandescent Lamps. Daylight incandescent bulbs employ a blue glass that absorbs some of the yellow and red rays from the light and thus produce a light more nearly resembling daylight in its effects on colored objects. Since this absorption process causes some loss of light, daylight lamps are not recommended except for applications where light of this color is required.

Vibration and Rough Service Lamps. For applications where the light bulbs are exposed to continuous vibration, a special vibration service lamp is available. This lamp employs a filament and supporting structure that make it less subject to damage by vibration.

For applications where the lamps are subject to rough service or shock, such as extension cord service and similar applications, still another lamp, known as a "rough service lamp," is available.

Mercury Vapor Lamps

One of the first types of vapor lamps to be used in industry was the Cooper-Hewitt low-pressure mercury vapor lamp. These lamps were made in the form of long tubes similar to fluorescent lamps, and continued to grow in popularity until the introduction of the fluorescent lamp. The Type H or high-pressure mercury vapor lamps were introduced much later than the low-pressure type and have gained extensive acceptance in industrial lighting, especially in high-bay applications. By far the most popular lamp of this type is rated 400 watts. Lamps of similar construction are also made in the 250- and 100-watt sizes.

Mercury vapor lamps are deficient in the red rays, which limits their use to applications where color discrimination is not an important factor.

One of the newer members of the mercury vapor lamp family is a 3000-watt lamp, made in the form of a tube approximately 4½ feet in length, which pro-

duces an initial light output of 120,000 lumens. This lamp is designed for use in high-bay applications. It has also been used as a source for indirect lighting in at least one large industrial plant having a ceiling especially designed to make such lighting practicable.

As with fluorescent lamps, the life of mercury vapor lamps depends upon the burning hours per start.

The 400-watt H-1 lamp, for example, has a rated average life of 3000 hours when burned 5 hours per start, and 5000 hours when burned 10 hours per start. If the current is turned off when a mercury lamp is in operation the lamp cannot be restarted until it has cooled enough to reduce the mercury vapor to a point where the arc can be reestablished. Under normal conditions this cooling requires approximately 7 minutes.

Fluorescent Lamps

Although fluorescent lamps have been available for less than ten years, their acceptance by industry has been so rapid that they now constitute one of the most important sources of modern industrial lighting. Fluorescent lamps are now made in several different types, but all employ the same fundamental operating principles in that they involve (1) the production of invisible ultra-violet by an electric discharge in a tubular-shaped bulb, and (2) the conversion of these invisible ultra-violet rays into visible light by fluorescent powders coating the inside of the tube.

The fluorescent lamp is thus fundamentally an electric discharge type of light source and, as with all lamps of this type, it must be operated in conjunction with ballast equipment designed to limit the current to the proper operating value. In addition, the so-called standard types of fluorescent lamps, which are by far the most widely used at the present time, also require an additional auxiliary element known as a starter. This is a small time-delay switch which provides a preheat period for the lamp electrodes before the lamp is started, and thus makes it possible to operate the lamps at relatively low voltages.

Standard Fluorescent Lamps. Standard fluorescent lamps are now made in eleven different sizes varying from the 4-watt lamp, which is ⅝ inch in diameter and 6 inches long, to the 100-watt lamp, which is 2⅛ inches in diameter and 60 inches in length. The most popular lamp for general lighting in industry is the 40-watt, 48-in., lamp, which is 1½ inches in diameter. The 100-watt lamp is also used for general lighting in industry, although not so extensively as the 40-watt lamp.

The most popular type of ballast is the two-lamp high-power-factor type. The light from the lamps is subject to some variation with the alternating current supply. These variations are too rapid to be followed by the eye but may become noticeable in the stroboscopic effect on rapidly moving machine parts. A feature of the two-lamp ballast is the fact that the lamps are operated out of phase so that the danger of stroboscopic effect is reduced to a minimum.

The starters that must be used with standard fluorescent lamps are made as a replaceable element and usually last the life of several lamps. Except in rare instances the ballast does not require replacement throughout the life of the lighting equipment.

The life of standard fluorescent lamps depends not only on the number of hours the lamps are burned but also on the number of times the lamps are started. Thus, the life of fluorescent lamps is now published for three different burning cycles of 3, 6, and 12 hours, as Table II shows.

Instant-Start Fluorescent Lamps. All standard fluorescent lamps operate on the hot-cathode, preheat-start principle. Instant-start, hot-cathode lamps are also available in a 40-watt T-12 bulb, identical in size with the standard 40-watt lamp, and also in a 40-watt T-17 bulb, identical in size with the standard 100-watt lamp. In addition, a line of hot-cathode,

TABLE I

OVER-ALL EFFICIENCY OF VARIOUS LIGHT SOURCES

Lamp	Lamp Watts	Ballast Watts	Total Watts	Rated Initial Lumens	Over-All Efficiency (Initial Lumens per Watt)
INCANDESCENT					
60 Watt	60	—	60.00	835	13.9
100 Watt	100	—	100.00	1630	16.3
300 Watt	300	—	300.00	5900	19.6
500 Watt	500	—	500.00	9950	19.9
1000 Watt	1000	—	1000.00	21,500	21.5
FLUORESCENT					
20 Watt, White	20	4.50	24.50	960	39.2
40 Watt, White	40	7.75	47.75	2320	48.6
100 Watt, White	100	16.00	116.00	4400	37.9
MERCURY VAPOR H-4	100	22.00	122.00	3000	24.6
H-1	400	40.00	440.00	16,000	36.4
H-9	3000	190.00	3190.00	120,000	37.6

TABLE II

LIFE OF FLUORESCENT LAMPS UNDER DIFFERENT CONDITIONS

Hours Burning per Start	15- to 40-Watt Lamps	100-Watt Lamps
3	2500 Hours	3000 Hours
6	4000 Hours	4500 Hours
12	6000 Hours	6500 Hours

instant-start lamps known as the long slim type is also available in four lengths—42, 64, 72, and 96 inches.

Instant-start lamps require a higher starting voltage than standard preheat-start lamps of corresponding sizes, and thus require a larger, more expensive ballast with a higher wattage loss. The over-all efficiency of operation, therefore, is somewhat less than with standard lamps. Because of the special cathode construction employed, the life of instant-start lamps compares favorably with that of standard fluorescent lamps.

Cold-Cathode Fluorescent Lamps. Instant-starting fluorescent lamps employing the cold-cathode principle of operation are also finding application in industrial illumination. These lamps operate on the same electrical principle as the cold-cathode sign tubing that has been used for many years for advertising purposes. They provide long life (10,000 hours) that is independent of the number of times the lamps are started. Such lamps are adaptable to either series or multiple burning through the use of transformer equipment of the type used in the sign industry. Some of this equipment involves high voltages, and special safety precautions must be taken in these applications.

Cold-cathode lamps and lighting equipment have not yet been made available on a mass-production basis, and for this reason it is difficult to show a cost advantage in the application of the lamps in industry.

Colors of Fluorescent Lamps. The color of fluorescent lamps is determined by the characteristics of the fluorescent powders that coat the inside of the tube. By blending various available fluorescent powders, an almost unlimited variety of colors can be produced. The most popular colors for general lighting in industrial applications are: White (sometimes called 3500 deg. White), daylight, and a new white known as the 4500 deg. White. These colors are available in all the various types of fluorescent lamps listed above.

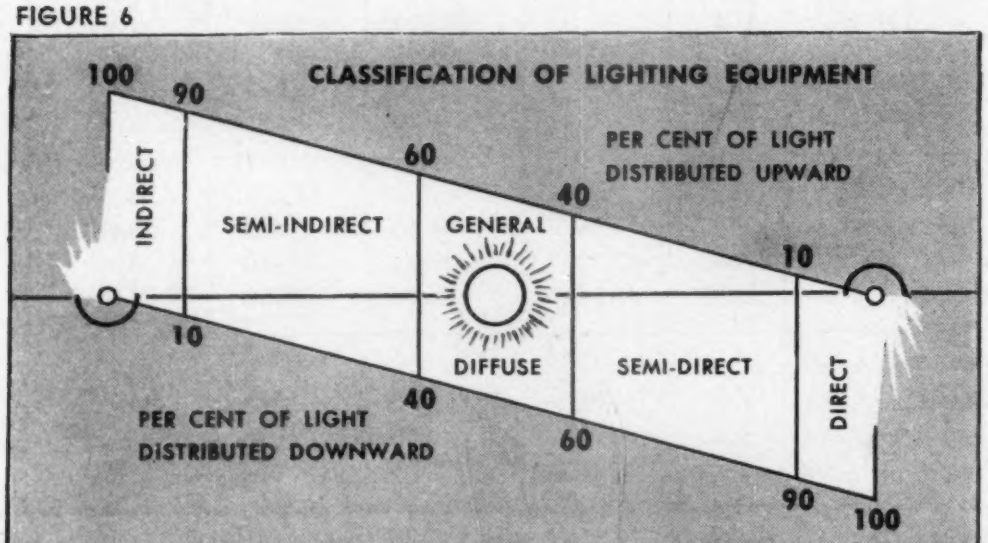
For applications where accurate color discrimination is a problem, the daylight lamps should be used; otherwise the white lamps will probably be found more satisfactory, since they produce a light that has a warm appearance by comparison with the cool appearance of daylight lamps.

The newer 4500 deg. White lamp produces a light that is about equivalent to a blend of equal parts of daylight and white, and produces a pleasing color preferred by some to the white or daylight.

LIGHTING REFLECTORS

The purpose of lighting equipment is to shield the light source and redirect the light in order that it may be effectively used. All lighting equipment may be classified, in accordance with the manner in which the light is directed, into five types, as Figure 6 shows.

FIGURE 6



CLASSIFICATION	PERCENTAGE UPWARDS	DISTRIBUTION DOWNWARDS
Indirect	90-100	0-10
Semi-indirect	60-90	10-40
General diffuse	40-60	40-60
Semi-direct	10-90	60-90
Direct	0-10	90-100

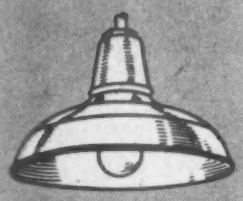
Direct Lighting Equipment. For the general lighting of industrial areas, direct-lighting equipment is by far the most extensively used. With this type all, or substantially all, the light is directed downward, and much of it goes directly to the working areas. Direct-lighting equipment may be further classified into concentrating and distributing types.

Concentrating types of direct-lighting equipment (Figure 7) employ prismatic and mirrored glass or aluminum reflectors. They are designed for applications where a craneway or other equipment makes very high mounting of the reflectors necessary. In such applications the mounting height may be as great or greater than the width of the room, and a concentrated distribution is necessary in order to direct the light to the working area without excessive loss due to light being directed to the sidewalls or out the windows.

Equipment for applications of this type must, therefore, be designed for high-wattage incandescent lamps (500 watts and up), or for mercury vapor lamps. Smaller units of the

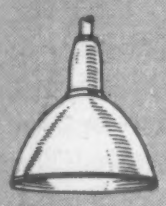
FIGURE 7

REFLECTORS FOR INCANDESCENT, MERCURY VAPOR, AND FLUORESCENT LAMPS -



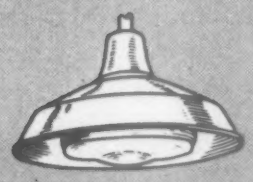
RLM DOME REFLECTORS

These reflectors are made of porcelain enameled steel and provide a light distribution that meets the requirements of many types of industrial applications. White-bowl lamps are recommended, but the use of inside-frosted incandescent lamps or mercury vapor lamps is entirely practicable at mounting heights of 20 feet or more. Glass cover plates are available for use in dusty or smoky locations if needed to keep the reflector clean



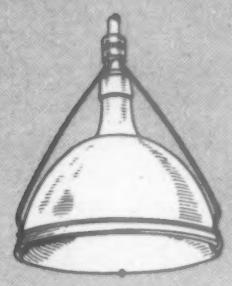
ALUMINUM

Designed to provide a concentrated distribution suitable for application where a craneway or other conditions make high mounting necessary or desirable



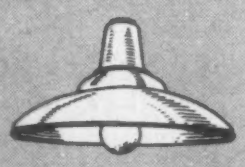
GLASSTEEL DIFFUSERS

In the glassteel diffuser the porcelain enameled steel reflector is fitted with an opal glass diffusing globe that completely encloses the lamp. This results in greater diffusion of the light and lessens the danger of annoyance from direct glare. Several slots at the top of the reflector permit a small amount of light to escape upward. Clear, inside-frosted, or mercury vapor lamps may be used



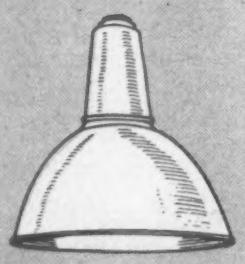
PRISM OR MIRRORED GLASS

These reflectors employ either prismatic or mirrored glass to produce a concentrated distribution of light primarily for high-bay applications



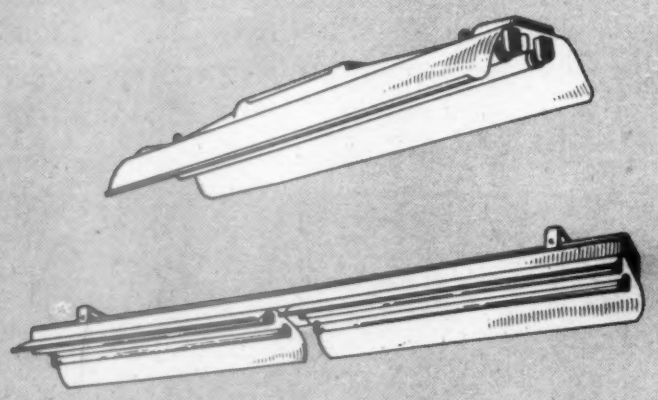
SHALLOW DOME REFLECTOR

Especially suited for areas such as storage rooms or loading platforms where critical seeing is not required, and glare from a partly exposed lamp can be tolerated in order to achieve the broad distribution of light needed to permit wide spacing of units



BOWL-TYPE REFLECTOR

Especially suited for applications where a strong concentration of light is required, or where low mounting heights require more than ordinary shielding to prevent danger of direct glare



FLUORESCENT LAMP REFLECTORS

Reflectors used with fluorescent lamps for general lighting usually are steel with a porcelain enamel or baked finish. Units carry two or three 40-watt lamps. Reflectors for 100-watt lamps also are available.

concentrating type are available for applications where this high concentration of light is desired, but in any applications of this nature the value of the higher level of lighting obtained on the horizontal plane must be weighed against the relatively low vertical illumination and the increased danger of reflected glare.

Distributing types of direct-lighting equipment usually employ reflectors of porcelain enamel or some type of white baked enamel, or synthetic finish. A wide distribution of light also can be obtained with aluminum-mirrored glass or prismatic glass reflectors of the proper contour.

The distinguishing characteristic of such equipment is the fact that the light is distributed in a broad pattern. This type of distribution provides a reasonably uniform level of illumination when the spacing between the reflectors is approximately equal to the mounting height.

The two most popular reflectors of the distributing type used with incandescent and mercury vapor lamps are the RLM Standard Dome and the Glassteel Diffuser. Both these units are made of porcelain enameled steel and are similar in contour. The Glassteel provides light of a somewhat better quality, since the lamp is enclosed in a glass diffusing globe, and the reflector is made with a number of slots in the top that permit some light to escape upward.

For applications where seeing requirements are not critical or prolonged, shallow dome reflectors that provide a very wide distribution pattern may be used in order to permit wide spacing of the units.

Mention should also be made of bowl-type reflectors that provide a distribution pattern that is roughly

midway between the concentrated and distributing types, and is suitable for localized general lighting applications where a moderate concentration of light is required. They are especially suited for applications where the lighting units must be mounted low, since the deep bowl provides excellent shielding of the lamp.

Fluorescent General Lighting Equipment. By far the most popular type of general lighting equipment for use with fluorescent lamps employs a rough-shaped steel reflector with a porcelain enamel or baked enamel diffusing finish. The most popular unit of this type employs two 40-watt fluorescent lamps. Reflectors of the same size can also be obtained with three 40-watt lamps. Similar units in larger sizes are available for 100-watt fluorescent lamps.

All these types of equipment are available as individual units or they can be used for continuous row mounting. In the latter case a special chassis, which is long enough to hold two reflectors and also serves as a wiring channel, usually is employed.

Continuous row lighting. Since the introduction of fluorescent lamps a popular method of lighting has involved the use of continuous rows in which the reflectors are mounted end to end with the chassis of the reflector serving as a wiring channel. The question of whether the rows should run the length of the room or crosswise of the room is one that has received considerable discussion. Proper decision involves a study of the area by an experienced lighting engineer.

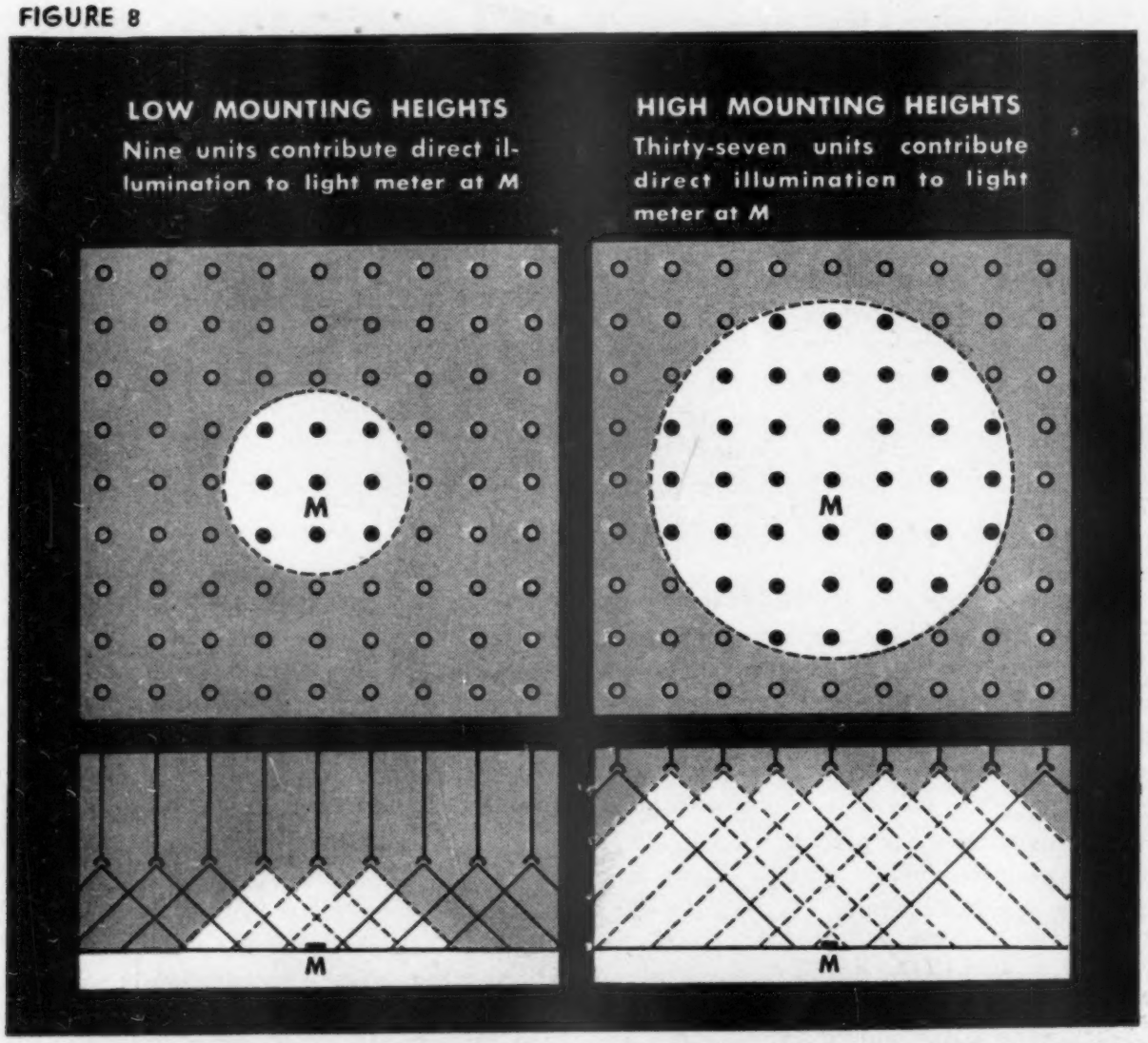
In some instances a so-called grid system, in which there are rows running both ways, has been used. Such a system has much to recommend it, since it is an approach towards what might be considered an ideal system in which the light comes from all parts of the ceiling. The expense of installation, however, probably will limit its extensive use for some time.

Shielding Angle of Direct Lighting Equipment

An important consideration in the use of direct-lighting equipment, particularly equipment of the diffusing type, is the avoidance of direct glare. One of the most effective methods of avoiding glare is the use of high mounting heights in order that the lighting units may be as far as possible outside the direct view of the workers. There seems to be, however, a tendency on the part of many designers of industrial lighting systems to use relatively low mounting heights, as a method of obtaining higher levels of illumination. Analysis shows (Figure 8) that low mounting heights do not result in as much increase in average illumination as is commonly supposed. Moreover, there are definite advantages from reasonably high mounting heights, in the avoidance of glare as well as in the attainment of greater uniformity of illumination.

An important characteristic of direct-lighting equipment to be considered in connection with the avoidance of direct glare is the amount of shielding provided by the reflector. This feature usually is stated as the angle of cutoff to the light center of the lamp, with incandescent lighting equipment. With fluorescent lighting equipment the shielding angle throughout which the lamp cannot be seen, when viewed along a line perpendicular to the lamps, is more commonly specified. Present-day equipment pro-

FIGURE 8



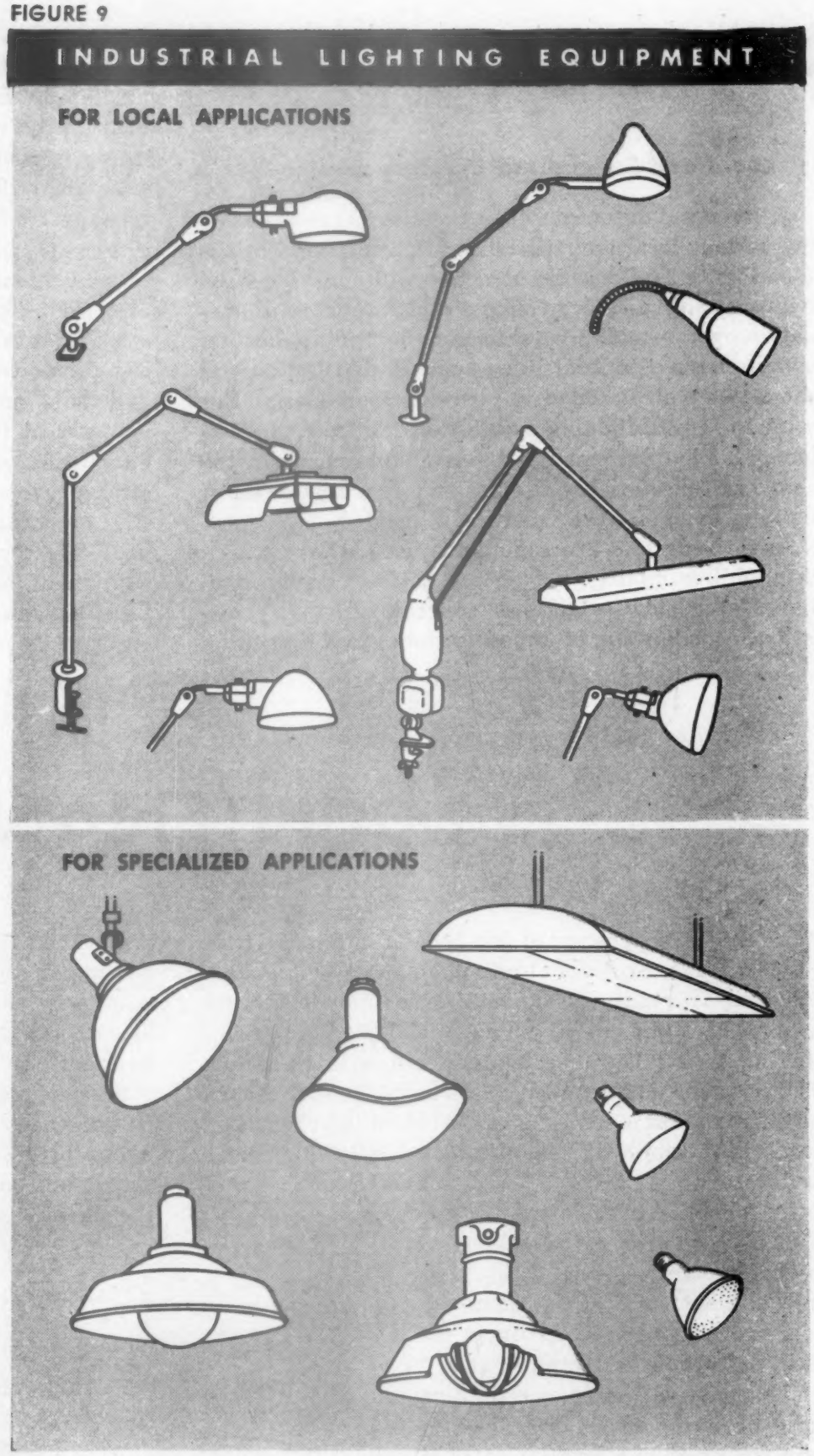
Illumination obtained on the working plane, measured by lightmeter at *M*, depends on the number of lumens delivered to the plane. Lumens received at mounting height in *A* differs from number at height *B* because more light is lost on sidewalls. Usually this does not involve a large portion of the light. High mounting heights do not decrease illumination so much as is commonly supposed

vides an angle of cutoff on the order of 15 degrees.

It does not take much calculation to see that this angle does not always provide completely satisfactory shielding at the mounting heights commonly employed, and there is a trend towards more shielding, even at the sacrifice of some degree in efficiency and uniformity of illumination. It can safely be predicted that this trend will continue.

The future will see more attention given to the problem of selecting the lighting equipment that provides the best shielding for the mounting heights and locations used on a particular installation.

FIGURE 9



Indirect, Semi-Indirect, and General Diffuse Lighting

The quality of illumination produced by lighting equipment other than the direct type, such as indirect lighting, semi-indirect lighting, and general diffuse lighting, has many characteristics that are desirable for numerous types of industrial applications. The use of lighting of these types has been limited, however, by the fact that the reflecting characteristics of the ceilings in most present-day types of industrial plants make their use impracticable, but they have been widely used in office areas. In fact, the tendency in office lighting practice is definitely away from the use of direct lighting because the severe and prolonged nature of the work carried out demands lighting of better quality.

There are numerous industrial operations that involve visual tasks as severe and prolonged as any encountered in office work, and there can be no question that these tasks should have light of the best quality in order to make possible the most efficient operation and to conserve the eyesight of the workers.

Fluorescent lighting has done much to improve the quantity and quality of lighting provided in factories, and it can safely be predicted that this trend towards good lighting will continue until each task, whether it be in the office or in the shop, will be provided with the best type of lighting that modern engineering can produce.

Increased attention, as time goes on, will undoubtedly be given to the problem of making the industrial environment more cheerful and bright by the liberal use of paint as well as light.

Inasmuch as all industrial plants include a certain amount of office areas, a few words on the subject of office lighting may well be added.

Large general offices are most satisfactorily lighted by units of the indirect, semi-indirect, or general diffuse classification, uniformly spaced throughout the area to be lighted in order to provide a substantially uniform level of illumination that does not place any limitation on the location of desks and other workplaces. Direct lighting troffer units recessed in the ceiling also have been popular for office lighting with fluorescent lamps.

Probably the most popular fluorescent fixtures have

been of the general diffuse and semi-direct types with glass or louver shields to prevent direct viewing of the lamps.

Local and Specialized Lighting Equipment

A variety of different types of reflectors are available for various local and specialized lighting applications (see Figure 9). Since the objective with most localized lighting equipment is to supply a high level of illumination over a small area, reflectors for this application usually have a concentrating type of distribution and should be well shielded to prevent direct glare. For some industrial lighting applications, reflector or projector lamps that employ silvered bulbs made in the shape of reflectors are used to supply a high level of lighting over an area where it is needed.

Angle reflectors are sometimes used where a high level of illumination on a vertical surface is important. Large-area, low-brightness sources, originally developed for lighting of imposing stones in the printing industry, are suitable for a variety of specialized industrial lighting applications.

There is also a variety of specialized lighting equipment of the vapor-proof and explosion-proof type for use in hazardous locations.

Exterior illumination of industrial properties may be desirable for any one of a number of reasons. Walks, driveways, and parking areas may be lighted for safety or convenience of employees. Light may be required also for exterior loading or construction work, and some light on the entire property usually is desirable as a protective measure. Buildings, signs, smokestacks, and tanks may be floodlighted for advertising value.

Standard types of street lighting and floodlighting equipment, mercury vapor, and in some instances sodium vapor lamps, may be used. Where a spot of light is required for an entrance or similar application, projector type lamps may be used. Frequently, the equipment for exterior lighting can be mounted on the buildings thus saving the expense of special mountings and special wiring.

MAINTENANCE

The efficient operation of any type of lighting system requires that careful attention be given to its maintenance. This matter is one of the most important, but at the same time one of the most neglected, aspects of the entire problem of providing proper illumination. The need for maintenance arises from the fact that in any installation there is a gradual loss of light resulting from the combined action of the following three factors:

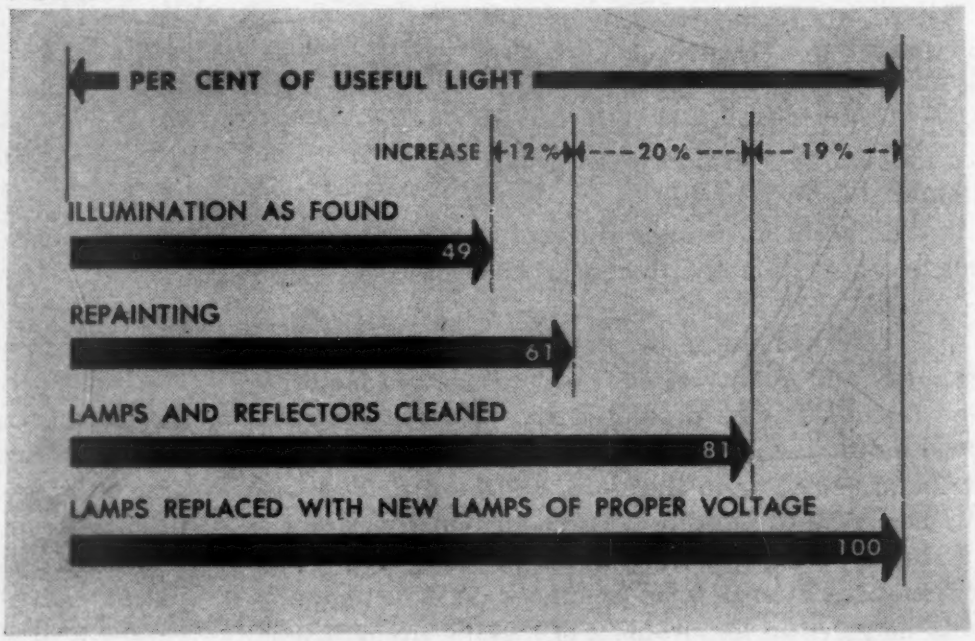
1. Collection of dust and dirt on the equipment.
2. Collection of dirt and dust on reflecting surfaces such as the ceilings and sidewalls of the room.
3. Normal depreciation in the light output of the lamps.

The most satisfactory procedure to insure proper light from the system is to set up a regular maintenance schedule. This schedule should include immediate replacement of burned-out lamps, and a complete cleaning of the reflecting equipment at regular intervals. The interval between cleanings as well as the type of cleaning procedure that should be employed will depend upon the nature of the interior in which the equipment is located.

Occasional checking with a light meter of the illumination in footcandles at a few important points will serve as a reliable guide. When the illumination has dropped to 75 per cent of the initial value, cleaning of the reflecting equipment will usually prove a good investment. An occasional cleaning or repainting of the interior can also do much to insure the best utilization of the light, as Figure 10 shows.

In some applications where the lighting equipment is not easily accessible, group replacement of the lamps may provide the most economical operation. This group replacement can be made at the same time the cleaning is being done.

FIGURE 10



Improvements attained where lighting equipment had suffered from continued maintenance neglect. (Reprinted from IES "Recommended Practice of Industrial Lighting")

HOSPITAL LAYOUT SAVES TIME FOR PATIENTS AND DOCTOR

E. A. IRVIN • MEDICAL DIRECTOR, CADILLAC MOTOR CAR DIVISION
GENERAL MOTORS CORPORATION, DETROIT

A familiar tool of work simplification—the process flow chart—was used to plan the layout of Cadillac's new plant hospital.

The building was designed to minimize waiting time of patients and to prevent the mingling of patients receiving different services. Results are measured in better service for patients, and in a saving of time and effort, not alone for patients but for nurses and doctors as well.

Three Types of Service

Hospital services were classified three ways: (1) Minor injury and accident cases; (2) serious illness or accident cases requiring emergency treatment; and (3) preplacement examinations.

Patient sequence charts (see illustration) were worked out for the "processing" of employees requiring these three types of service—and the building was built around them.

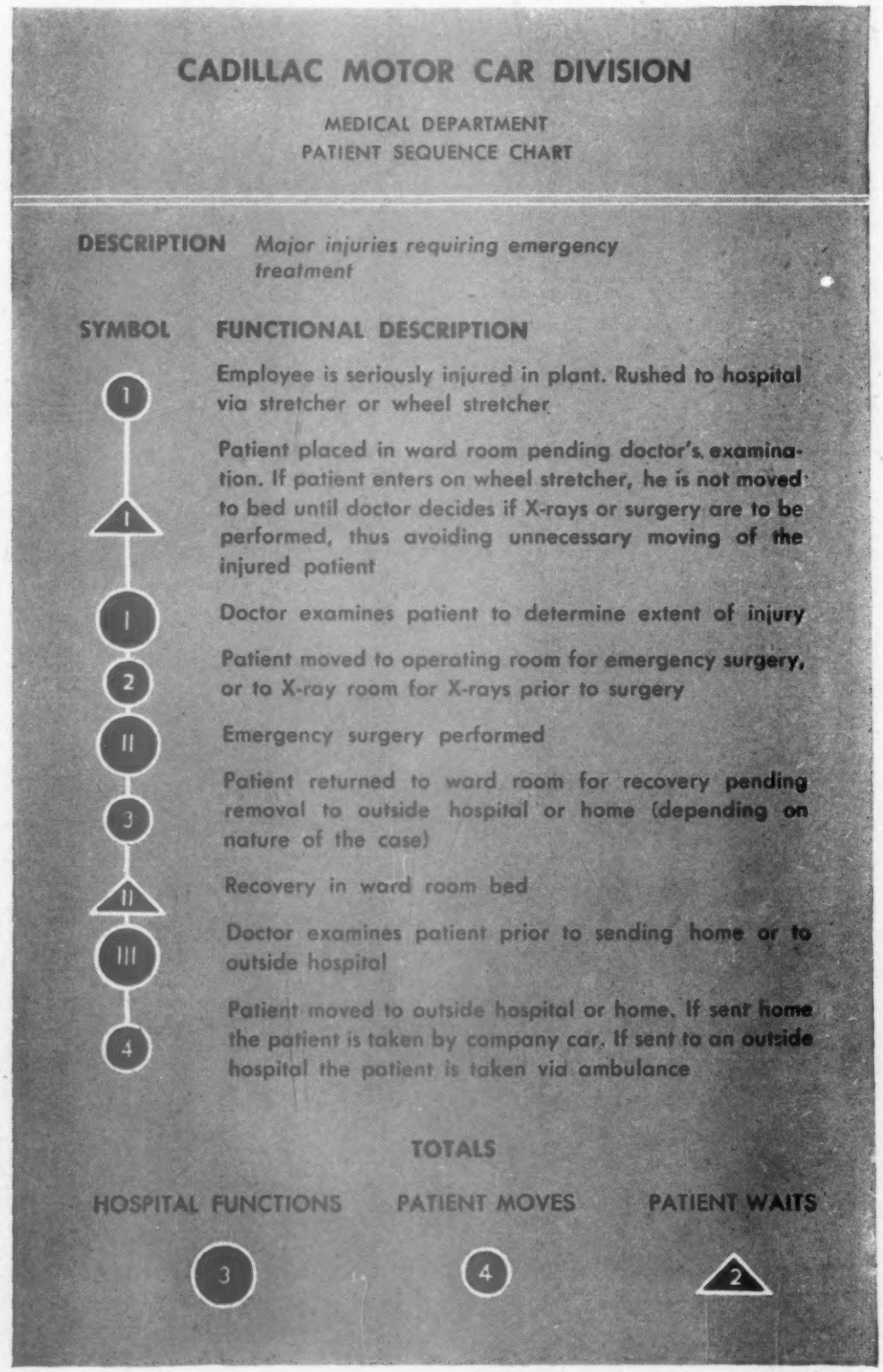
The main examination area, for instance (see patient flow chart and hospital layout, next page) is separated from the treatment area, preventing the intermingling of job applicants and employee-patients in the hospital for treatment. Job applicants enter the hospital directly from the office or factory. Facilities to handle the two groups were placed in close proximity, however, to avoid duplication of equipment or personnel.

Time Savers for Staff

The building was designed in the shape of a *U* with two places to cross over between the two long sides of the *U*. The cross-overs are time savers for the staff.

Cabinets, lockers, and most of the equipment are built into the walls and recessed to eliminate dust, dirt, and moisture formation. The entire building is air conditioned, and outside rooms have supplemental radiant heating.

An interdepartmental communication system reduces lost motion

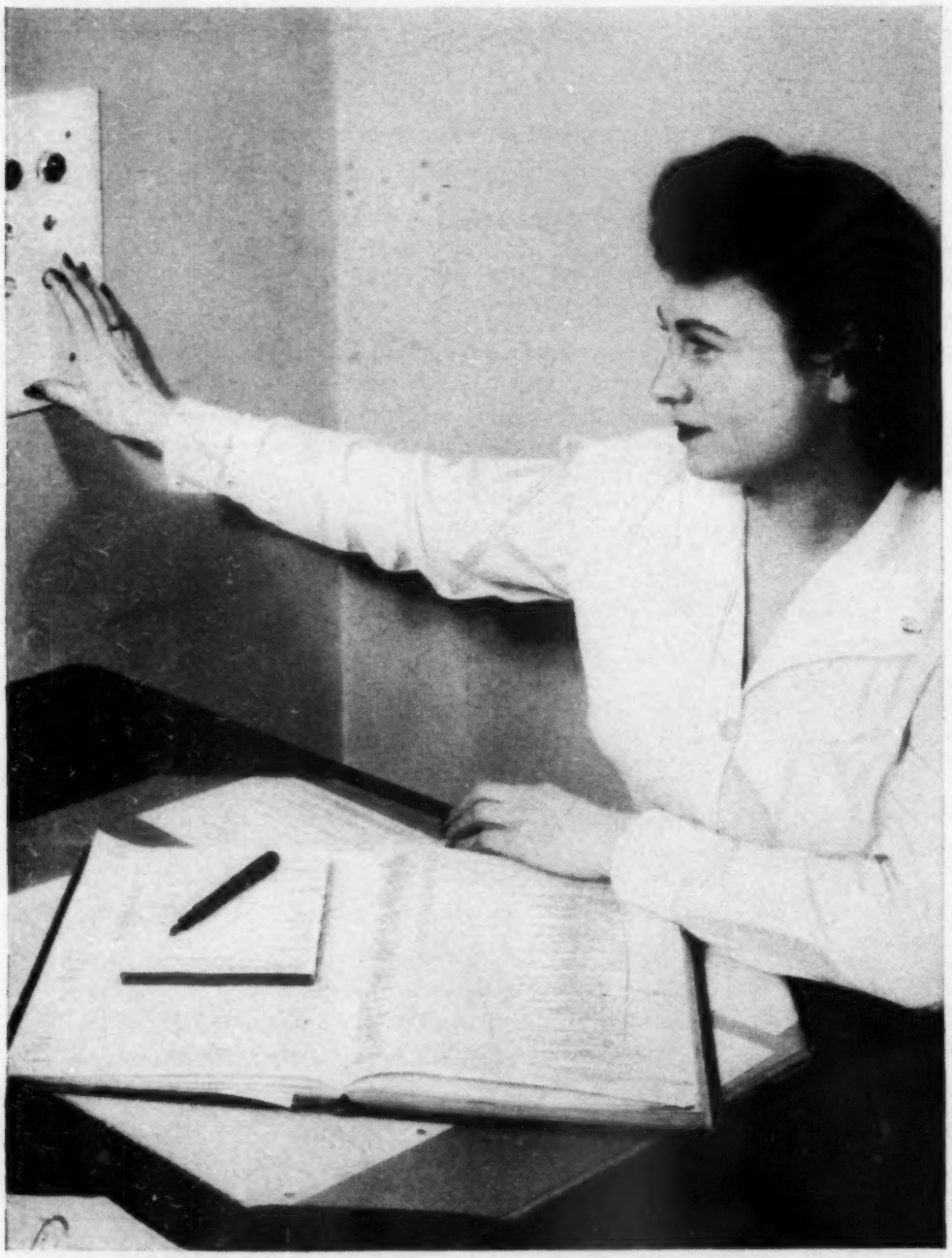

CADILLAC MOTOR CAR DIVISION
MEDICAL DEPARTMENT
PATIENT SEQUENCE CHART
DESCRIPTION Major injuries requiring emergency treatment
SYMBOL
FUNCTIONAL DESCRIPTION
1
Employee is seriously injured in plant. Rushed to hospital via stretcher or wheel stretcher
I
Patient placed in ward room pending doctor's examination. If patient enters on wheel stretcher, he is not moved to bed until doctor decides if X-rays or surgery are to be performed, thus avoiding unnecessary moving of the injured patient
I
Doctor examines patient to determine extent of injury
2
Patient moved to operating room for emergency surgery, or to X-ray room for X-rays prior to surgery
II
Emergency surgery performed
3
Patient returned to ward room for recovery pending removal to outside hospital or home (depending on nature of the case)
II
Recovery in ward room bed
III
Doctor examines patient prior to sending home or to outside hospital
4
Patient moved to outside hospital or home. If sent home the patient is taken by company car. If sent to an outside hospital the patient is taken via ambulance
TOTALS
HOSPITAL FUNCTIONS
PATIENT MOVES
PATIENT WAITS
3
4
2

Flow and process charts, like the one at right, were developed for three major functions of new hospital. Use of time and motion economy principles improves service and eases staff's work

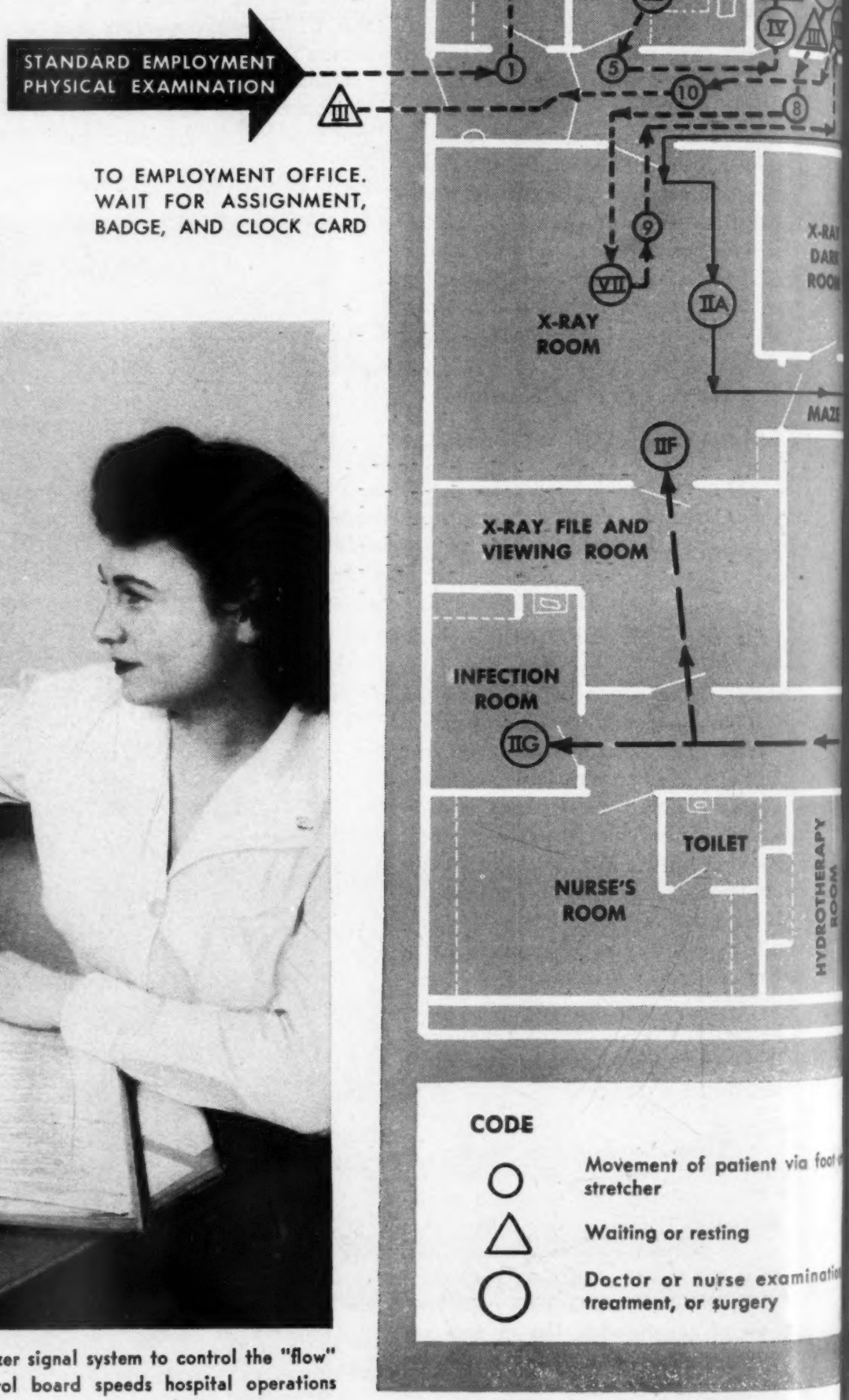
and extra walking. Records are passed into the main examination room through a "slot in the wall," keeping them confidential and allowing nurses to call patients by name. A signal system from the doctor's office to the X-ray room and from the X-ray room to the dressing room has proved itself to be a big time saver.

The flow of patients in all phases of the hospital's operations is designed to keep waiting time and walking distances to a minimum. Examination and treatment rooms are grouped as conveniently as is possible. Equipment is located, wherever possible, at the point along the flow chart line where it will be used most. Service functions are similarly located. For example, the X-ray room is used more often for pre-placement examinations than for treatments. It is therefore placed in the examination area, but is close to the treatment section.

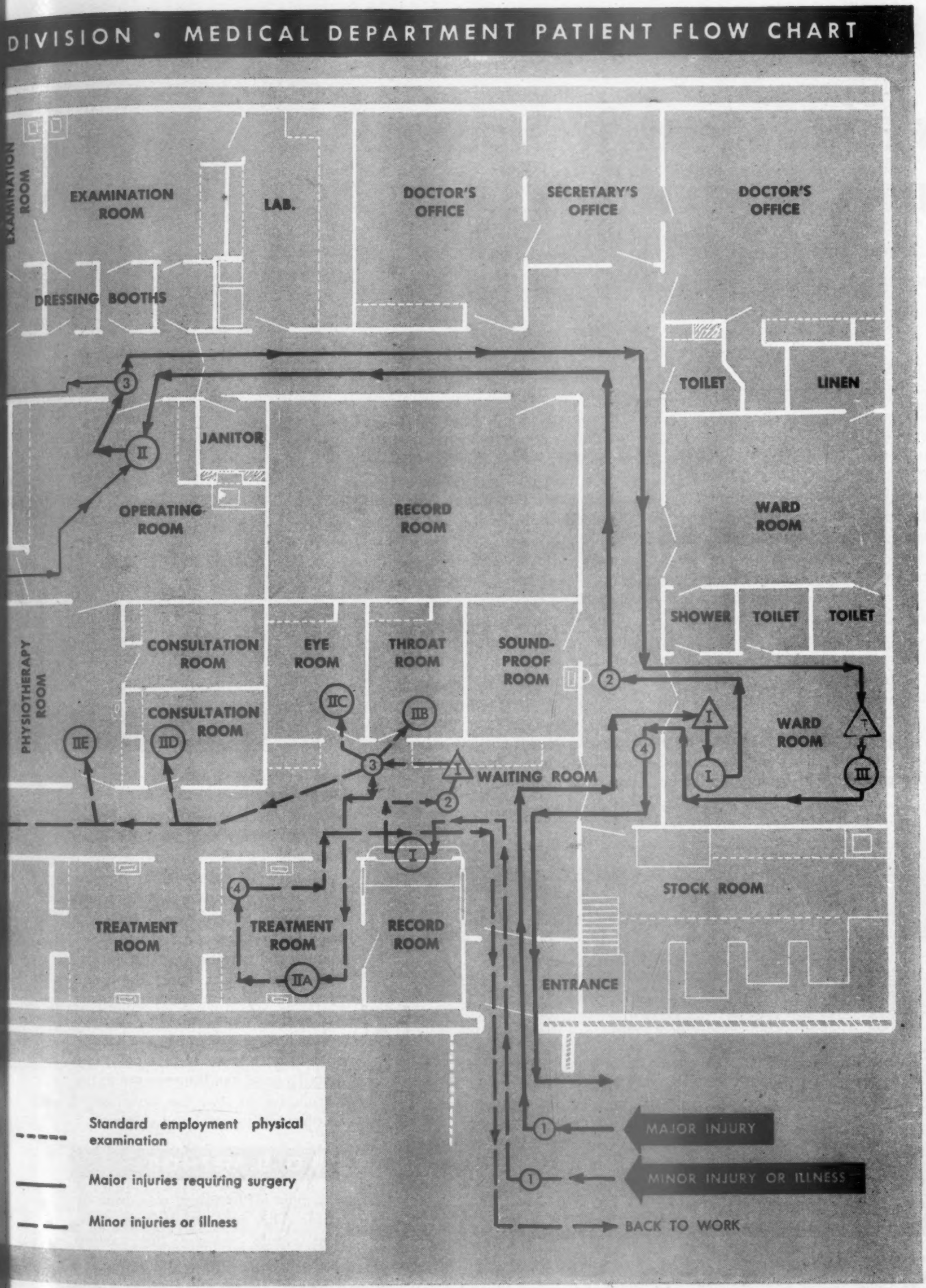
Cadillac's experience shows that industrial medical departments can well use the experience of their companies' engineers in planning and operating plant hospitals. Better service for patients, increased efficiency, and the full utilization of the space available make it more than worth while.



Nurse in Cadillac's new hospital uses buzzer signal system to control the "flow" of patients through X-ray. Signal control board speeds hospital operations



DIVISION • MEDICAL DEPARTMENT PATIENT FLOW CHART



ECONOMICAL HANDLING IN A WAREHOUSE

WILLIAM S. WHEELER • FIELD EDITOR, *FACTORY*, CHICAGO

Delivery to warehouse, sorting by type, and final shipment of the product have all been streamlined at Kellogg Company, Battle Creek, Mich., through the use of belt conveyors, conical sorting tables, and the use of the fork-truck-pallet system for storage and shipping. Efficiency in warehousing has been increased 60 per cent. Unit costs are lower. Shipments to the distributor and consumer are 12 per cent faster. And the capacity of the storage area has been increased from 100,000 cases to over 500,000 cases of all types of breakfast food.

Management Decisions—Kellogg officials had long concluded that considerable savings could be realized in their handling operations if they were to store and ship their products from a centrally located warehouse. Prior to the installation of this new system, products were moved either into storage by hand or directly into freight cars via the hand truck method. Warehousing space was small and what area they did use consumed productive space on the fifth floor of the main plant.

Because of these space restrictions, surplus stock could not be built up from which shipments could be made later during peak demands. Branch warehousing was out of the picture because of the high overhead, handling, and operational expense. Therefore, production was confined to restricted amounts because of the lack of storage space and the hand handling methods.

As packed cases of food pass final inspection, they are placed on one of two belt conveyors, which carries them almost half a mile through covered, overhead shed to the warehouse

Plans were developed to accomplish these objectives: Build a new warehouse which would be large enough to take care of peak demands; deliver the cases of breakfast food direct from the main production lines to the warehousing and shipping section via overhead belt conveyors; simplify the sorting of the many types of products; and install a good handling system in the warehouse so that the cases could be efficiently stored and shipped.

OLD METHOD

Almost all handling was done by hand. This was costly and slow. Men would remove the various types of breakfast food from the production lines and manually pile

Packages are delivered from conveyors to revolving, conical sorting tables. As cases pass the appropriate pallet, attendant takes them off and stacks them for removal by fork truck. Incoming cases move from center to periphery as table revolves

them on hand trucks located adjacent to each production line. When filled, the hand trucks were pulled either to the shipping dock or to storage. If to storage, the trucks were pulled to an elevator where they were raised five floors to the storage section. Here the cases were removed from the trucks one by one and piled in the storage area. When ready for shipment they were again removed from the stacks, piled on the hand trucks, moved by elevator, and pulled to the shipping dock. Freight cars were loaded by hand. All of this consumed many man-hours and slowed down shipments. Only 100,000 cases could be stored at any one time. During rush periods it was necessary to rent outside storage space—a procedure which was quite expensive in rental and handling costs.

NEW METHOD

Now, practically all the hand work is eliminated. A warehouse inspector stands guard at the end of the production lines carefully watching for any cases that are in bad condition. When a damaged case is detected, it is removed from the line and not permitted to enter the new belt conveyor system which feeds directly to the new warehouse located over half a mile away. This inspection guard at the production lines saves many a dollar in handling costs and sorting man-hours. Cases in good condition feed from the production lines to the warehouse for sorting, storage, and shipment. The sectional construction of the warehouse—each section *must* be emptied completely at least once each 30 days—insures against food remaining too long in storage.

Warehouse—The building is 230 feet wide and 840 feet long which includes approximately 144,000 square feet of warehouse area. The bays are 40x60-ft. spans. An 18-ft. ceiling height is used to utilize vertical "air rights" for storage and also because it is the most advantageous for the fork-truck-pallet method of handling.

On both sides of the warehouse are depressed track rail sidings, each with a capacity of 18 cars. Sidings are fully enclosed so that cars can be loaded in any kind of

weather. At one end of the building there is a completely enclosed truck receiving and shipping dock. The warehouse offices are located at this same end of the building.

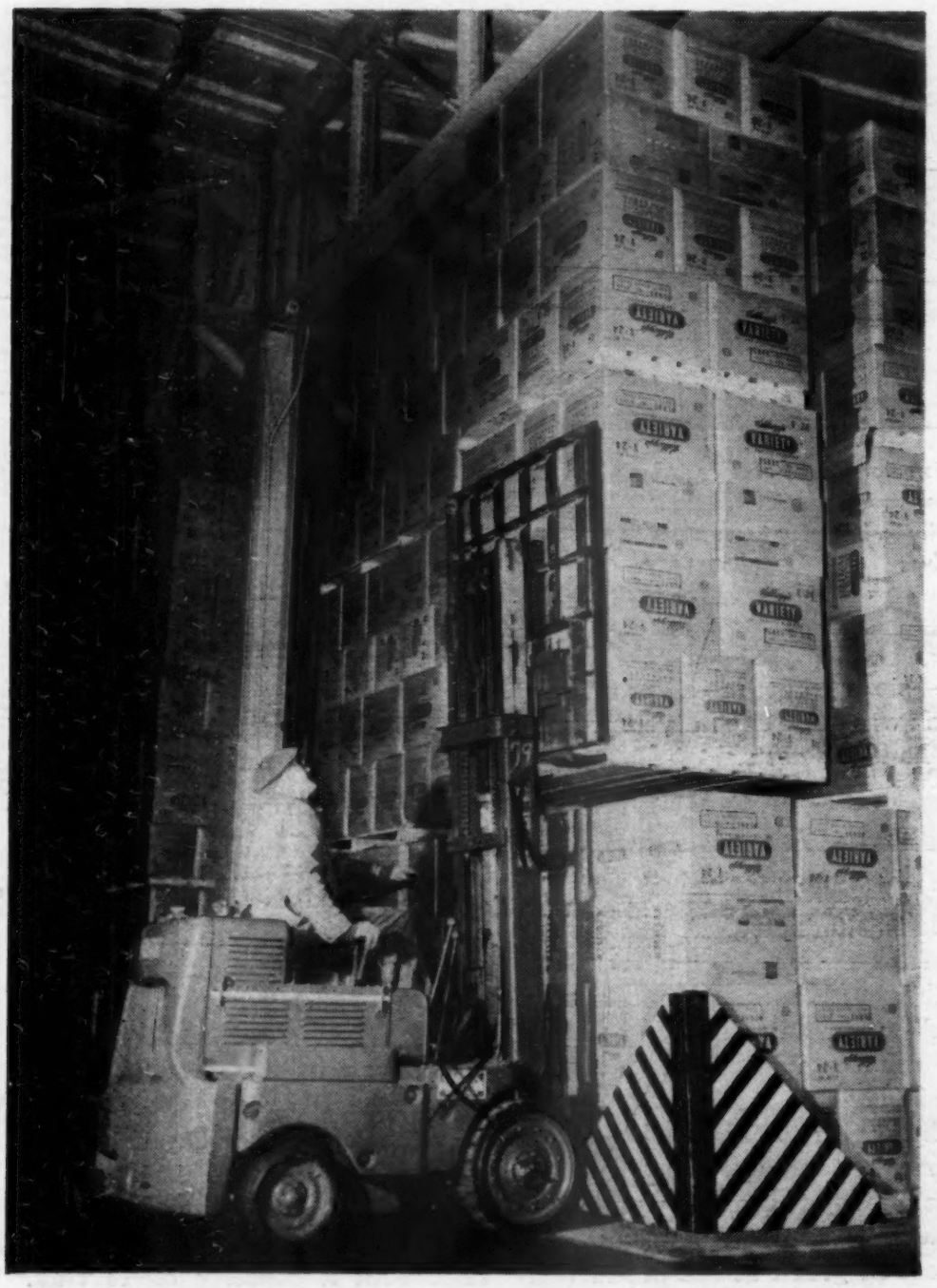
Conveyor System—Since the warehouse is located approximately half a mile from the main plant, the problem of moving the completed merchandise was present. Trucking was out of the question because of the quantity and speed of flow involved. A belt conveyor system was selected as the best possible manner to perform this job. Thus a double belt conveyor was constructed from the main plant to the center of the warehouse. The conveyor is mounted in a structural steel shed about 20 feet above the ground. It crosses several railroad tracks and a road. All conveyor lines carrying finished products feed into this warehouse conveyor.

Sorting System—With the use of the conveyor system, a sorting problem presented itself in the warehouse. The result was the development of a rather unusual sorting scheme. A conical sorting table was installed in two places in the center of the warehouse. One of the belt conveyors feeds each table. The conveyor feeding in from the main plant drops its load at the top of the cone on the sorting table. The cone revolves slowly about its axis and the cases ride around on the perimeter until taken off. The tables are approximately 30 feet in diameter and the sorting is performed by attendants. The number of men placed at each table varies between two and five, depending on the conveyor load from the main plant. Around the sorting tables are placed 25 to 30 pallets, each for a different commodity. As each pallet load is completed, it is taken away either to storage or to the shipping docks by a fork truck, and an empty pallet is deposited in its place.

Pallet System—The fork-truck-pallet method was selected as the means of handling all work within the warehouse. A fleet of 16 fork trucks, each of 3500-lb. capacity, perform this operation. A pallet size of 44x54 inches was decided upon after an extensive period of testing. Each case size was listed, and all were fitted to pallets of various sizes. It was proved thereby that the 44x54-in. size would accommodate all loads. Pallets are not used for shipping because considerable space would be lost in each carload. To lower shipping costs, the entire cube of each car must be utilized. Over 10,000 pallets are used.

All outbound merchandise is removed from storage by lift truck and taken to the respective loading area, whether it be a rail siding or the truck dock. The pallet load is then deposited inside the car and the material removed and loaded. The empty pallets are accumulated on the docks and returned to the empty pallet storage area.

With this streamlined handling system, food is delivered fresher to the consumer. There is little physical effort on the part of any employees. Working conditions are improved. Costs are reduced. Efficiency is increased. All in all, it adds up to producing a better product at ever-lowering costs. Lossage is reduced because the product is handled by mechanical means rather than by hand. The new system has succeeded in stabilizing employment, because now production can be planned ahead. Production is channeled into storage during periods of low demand so that the surplus can be used during periods of high demand. In this way, every worker works the year around and production is steady.



Pallets and fork trucks expedite vertical storage, increase capacity of warehouse. Painted metal bound wood safety guard prevents damage to lowest cases

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Signs point to labor peace through 1948. That's the outlook for industry — generally.

There'll be strikes, of course. Perhaps many of them. But nothing contagious, or economy-shaking. Nothing which can't be taken in stride.

Chances of industrial peace will be better if Truman signs the new labor bill or Congress passes it over a veto. But the absence of a new law won't preclude peace. Not for the short period ahead. Some reasons:

1. Steel contracts call for no strikes for two years. True, Philip Murray may reopen the wage issue next April. But he can't strike if there's no settlement.

2. Willingness of John L. Lewis to bargain separately with parts of the soft coal industry lessens the chances of an industry-wide shutdown. Peace in coal and steel should be reflected in autos, electrical, textile, steel fabricators, railroads, and other industries.

3. It will be bad union politics to strike in '48. CIO wants to revitalize PAC. Both CIO and AFL want to settle some scores in Congress, take credit for electing a President. And they can't do it with strikes. Not if 1946 means anything.

4. Job uncertainty, a drop in industrial activity, settling of (if not a drop in) living costs — all predicted — will cool labor's ardor for striking.

A new law, if we get one, would likely hit strikes in these ways:

— *Outlaw jurisdictional strikes.*
— *Require secret strike ballots.*
— *Delay big strikes affecting public welfare.*
— *Increase strikers' risks.*

On the whole, the new law would protect rights of individuals — union or non-union — from abuse by arbitrary union leaders.

Examples: Bans on closed shop, boycotts, jurisdictional strikes, union coercion; secret strike ballots, voluntary check-off, union financial reports.

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By signing the portal pay bill, Truman built a political shelter for vetoing the more comprehensive union regulatory labor bill. Thus he could seek to refute the charge that he's opposed to all laws fought by organized labor.

Democrats need both labor and independent votes to win in '48. Around Washington they say: "Truman may not win *with* the labor vote, but he surely can't win *without* it."

A veto of the portal pay bill would have been an empty gesture, anyhow. Congress was certain to override. By approving it, with a plea for upping the minimum wage from 40 to 65 cents, Truman attempted to steal the political play from the Republicans.

Ambiguous language in the Portal-to-Portal Act of 1947, as it's called, will need court interpretation. This may take years. Until then, employers can be guided by the general intentions of Congress.

In this law, Congress intended to:

1. Wipe out all pending wage claims except those based on activities compensable by custom or practice.

2. Do likewise for future claims where the activity occurs outside regular working hours.

3. Protect employers who, in good faith, abide by a government ruling.

4. Fix a two-year limitation on all claims.

5. Allow courts to assess less than double damages.

But there's no curb on what unions can bargain for. This year's 15c "package" wage increase includes many fringe adjustments besides the 11½-12½c hourly rate boost. Demands for these extra economic benefits may become general in most big industries. They are:

Severance pay, up to eight weeks, for workers displaced by technological changes. (U. S. Steel, other steel)

Company-financed life and health insurance and family hospitalization costing about 4 cents an hour. (Allegheny Ludlum Steel)

Six paid holidays. (General Motors, Chrysler, Westinghouse, General Electric, others)

Three weeks' vacation after 20 years (General Electric) or 25 years. (U. S. Steel)

Design for better living. That's another object of some steel contracts. They require periodic labor-management sessions for appraising problems which arise under the agreements.

DEFLATED: AFL-CIO unity balloon.

QUOTE: "Both (labor and management) must make money if this country is to continue under a system of free enterprise." — H. E. Reilly, Chicago AFL official.

SHEEPSKIN: Honorary doctor of laws, to James Carey, CIO secretary-treasurer, by Rollins College.

BOOMING: Union interest in labor education. Labor extension funds being sought from Congress. Summer institutes arranged by many unions.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Prices are on the downgrade. Not all the statistics are in yet, but it looks as though the peak came in April.

Don't look for a steep decline, however. And don't expect all prices to go down.

It will be a gradual slide m most lines. Bottom will be struck in 6 to 9 months. Of course, there will be some dramatic plunges — but they won't be typical. And a few prices may go up — but few sellers will be able to make higher prices stick.

President Truman's campaign to talk prices down didn't cause the slide. At best, it gave it an initial push. The old law of supply and demand was the thing that did the trick. Many prices soared after OPA went out the window — this weakened demand.

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Meanwhile, production of most things set one new peacetime record after another. Part of the output went to fill normal consumer demands, part went to rebuild stocks all along the line, and another part went to fill backed-up demands which had piled up in wartime.

Now more and more lines are reaching the point where stocks have been rebuilt and backed-up demands filled. *So production begins to outrun sales.* This puts pressure on prices. It leads to production cutbacks and layoffs.

This is what's been happening in cotton textiles, soft woolens, shoes, small appliances and radios, canned and frozen foods. In a word, these industries are going through the shift from sellers' to buyers' markets.

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Best news on the price front is that processed food prices are feeling increasing pressure. Buyers' resistance is growing as people try to cut down on food to buy more of other things. Then stocks are piling up — this means that production is outrunning sales. So the outlook is for a gradual decline in food prices.

Construction will play a key role in the general business outlook in the months to come. Rising new construction had been counted on to take up the slack that is developing in other lines.

But the physical volume of construction is running behind last year. A few months ago, the government was talking about a million new homes in 1947. *However, fewer new homes are being started this year than last.*

The construction lag will react on building materials producers. It may also put 300,000 building workers on unemployment rolls by summer.

Soaring building costs explain the lag. Cost of a standard 6-room house is almost double the pre-war norm. So new homes have been priced out of the market. And many big industrial and public projects have been shelved.

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Costs can be brought down before long, however. A Cleveland builder says the house he built to sell for $10,000 late last fall can be built for $8000 now. Labor is more efficient. Materials are flowing smoothly and costing less.

Once costs come down, building will pick up again. The housing shortage is almost as bad as ever. And there's a big backlog of other construction.

While it lasts, however, the building lag will be a heavy drag on general business.

Manpower will ease considerably in the next few months. Most recent census figures show no significant rise in unemployment. But the surveys were taken in May, just before cutbacks began to hit.

Since then some unemployment has shown up in New England, New York City, and southern textile centers. Total number of layoffs hasn't been large — it's around 150,000 so far. But it may mark the beginning of a trend.

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Add fuel oil to the list of shortages. Homes and industrial plants have been switching to oil. Most new homes have oil burners. Meanwhile, use of gasoline is up as more new cars hit the road.

Bottlenecks in transportation and refining bar much of any rise in production of petroleum products. So the pinch may be severe if next winter is unusually cold.

Industrial production hit what may prove to be the year's high in April. May was a shade lower. Auto production was off — several plants outran their sheet steel supplies and had to shut down assembly lines.

Most experts look for a slow decline in the production index in the next six months. But these same experts are still betting that bottom will be struck when the index drops 10 to 15 per cent — *and that's not much of a recession in anyone's book.*

HOW TO SELECT AND MAINTAIN MOTOR CONTROLS

L. E. MARKLE • INDUSTRIAL AND CONTROL DIVISION, WESTINGHOUSE ELECTRIC CORPORATION, EAST PITTSBURGH

Proper selection of the control is essential to satisfactory operation of a motor, as well as to minimum cost of the installation. The reason is, of course, that modern motor control serves a multiplicity of functions, from the very simple one of connecting and disconnecting power to the more complicated duties of protecting against overloads; regulating speed and torque where necessary; and coordinating the timing of these functions as the application requires. As the functions that the motor control is to serve increase in importance and complexity, so does the device.

When an installation involving a motor and a controller is being considered, it will be found there are a considerable number of functions that can be provided, such as start, stop, accelerate, decelerate, time, switch, protect. Since all possible control functions cannot be built into a single controller design, it naturally follows that there are a large number of types of controllers that can be supplied for a given motor. It is important, when selecting a controller, that the design provide all desirable features of motor operation, but, at the same time, incorporate none that is unnecessary.

Since these control features are interrelated it is most important that all such conditions be considered before controllers are designed. For example, an installation requiring speed control over a wide range can best be provided by a d.c. motor which would, of course, eliminate the use of the a.c. type.

Selection of Controller Functions

The following questions represent essential information (many minor points to be considered are not listed) that must be known before a suitable controller can be built for any installation:

1. Is the available power supply a.c. or d.c.?

2. Would a.c. or d.c. power be better for the application?

3. Should the controller be manually or magnetically operated?

Manually operated controllers are in general smaller and less expensive than the magnetically operated type. However, magnetically operated controllers can be made either completely automatic or partially automatic in operation and may be remotely located, thus saving floor space, since a pushbutton station or small master switch at the machine is all that is required.

4. Should the controller provide for reversal of the motor, or only for uni-directional operation?

5. May the motor be started at full line voltage or should the controller provide starting at reduced voltage, with means to accelerate the motor to full speed with rated line voltage applied to the motor terminals?

6. If power fails should the controller permit the motor to restart when power is again available, or should the controller make it necessary for an operator to restart the motor?

If the first provision is to be met, a low-voltage release circuit, such as is used for ventilating fans, compressors, and vital installations that should be operable at all times, is required. If the second provision is to be met, a low-voltage protection circuit, such as is used for machine drives where operators could be injured if a machine should start unexpectedly, must be used.

7. Should the controller provide speed control of the motor, or may the motor always operate at a constant speed?

Controller Capacity

Motors are rated in horsepower and must be selected with ample capacity to drive the given load. In a comparable manner, control apparatus is designed and built to meet certain guaranteed ratings. The controller parts must be applied in accordance with the ratings, with due consideration for the load conditions and the duty cycle.

Most controllers will operate for a short time under overload conditions, without damage. They will not, however, operate under severe overload conditions for long periods. Again, they will open and close motor circuits under normal operating conditions, but they are not designed to be used as circuit breakers.

Coils for magnetically operated control devices are guaranteed to withstand 110 per cent of rated voltage. If higher voltages are applied, the coil life will be reduced. When the voltage is excessive a coil failure may occur in a very short time.

If uninterrupted operation is vital to a manufacturing process, a controller and motor with some surplus capacity is often considered to be good protection against loss of production.

When an installation is properly made—that is, when all equipment is of ample capacity for the service required and installation work has been well done—the maintenance expense should not be high. In fact

some additional expense to insure the installation of good equipment in the first place will be well justified by reduced maintenance expense. However, some parts eventually do require repair or replacement

In this respect, it will pay to give close attention to the following points:

PREVENTIVE MAINTENANCE

1. Moisture. A controller must be kept dry at all times. Water, oil, or grease will eventually cause insulation troubles. Moisture may be removed by wiping with clean, lint-free rags; by blowing with compressed air at pressures of 40 to 50 pounds per square inch; or by providing heat for drying.

Oil and grease removal requires the use of a suitable solvent.

Condensation is often prevented by using a small heater-lamp or resistor within the enclosure, which is energized when the controller is not in use.

2. Dirt. Dirt in any form is objectionable when allowed to collect on controller parts. It can be wiped off with clean, lint-free rags or blown off with dry compressed air, but the best precaution against its collection in steel mills, cement, flour, and lumber mills, mines, and other places where dust is prevalent is (1) to provide a separate room supplied with clean air for all control devices or (2) to use dust-tight enclosures.

3. Corrosive atmospheres. The atmosphere about chemical plants attacks the finish on metallic parts and causes more rapid deterioration of parts than occurs in clean air. For safety and trouble-free service, all control equipment subjected to corrosive atmospheres should be housed in a room that is kept under pressure with cleaned air. If such an installation is not possible the entire controller assembly may be immersed in oil to provide protection against destructive fumes.

4. Explosive atmospheres. Gasoline vapors, grain dust, mine gas, and many other explosive atmospheres require special enclosures to prevent general explosions in surrounding areas. These enclosures are designed to withstand internal explosions without permitting any flames or sparks to reach the outside air. If permitted, the entire controller may be immersed in oil.

5. Lubrication. General lubrication of the pivots and bearings of controller parts is not recommended. If lubricants are applied the inevitable collection of dust and dirt causes a general sluggishness of operation that is very undesirable. Consequently, bearings are commonly made to withstand many operations without lubrication.

6. Rust. Protective finishes are applied to metallic parts of control equipment to prevent rust and corrosion. If the finish is inadequate or has been scratched or broken, some rusting will occur. All precautions ought to be used to avoid rusting or corrosion of parts.

7. Contacts. The electrical contacts on a controller are required to open and close electrical circuits. Hence, they are subject to both mechanical wear and electrical burning. They are the parts that most frequently require replacement. Contacts usually are made either of copper or silver.

When contacts are severely burned and pitted, or when worn thin, they must be replaced. A clean copper contact of rough, sandpaper appearance need not be replaced. Silver contacts naturally have a dark discoloration and need not be kept bright, whereas a copper contact of dark appearance should be cleaned.

This difference exists because the dark oxide of silver is a good electrical conductor whereas the dark surface coating naturally formed on copper is not a good conductor.

8. Contact pressure. The current-carrying capacity of a contact depends much upon the contact pressure, which in turn depends upon the contact spring pressure. When contacts wear thin the spring pressure is decreased; hence such contacts must be replaced to obtain normal spring pressure.

When springs have been subjected to severe arcing or heating they lose temper and strength, and ought to be replaced.

9. Excessive temperature. High temperature is always a sign of trouble that should be corrected. Many electrical controllers are designed to operate at temperatures too high to test by touching with the hand; therefore the normal operating temperature should first be determined before reporting any that seem to be excessive.

High temperature in coils is caused by high voltage, partially short-circuited coils, or, in series coils, by too much current.

On contacts, high temperatures result from overloads, poor contact surfaces, or loose connections.

On any wiring joint a loose connection will cause overheating. It is one of the most common causes of this trouble.

Preventive maintenance is not possible, without a corps of capable inspectors and the facilities and organization for effectively doing good maintenance work. Inspectors ought to be able to detect the need for repairs, and be competent to make quick or minor repairs without additional aid.

With some installations the serious losses incurred during unexpected shutdowns often justify keeping one or more complete controllers as spare units. If an unexpected interruption occurs and the repairs needed are extensive, a spare control unit can be quickly put into service and the defective one repaired when time permits.

CHANGES IN CONTROLLERS

At times, controllers are moved to a new location where a different power supply is to be used Under such conditions, certain changes in them may sometimes be made to meet the new conditions. The following statements indicate, in general, the kinds of changes that are

Dust has little chance of getting into the master control benchboard for a 132-in. reversing universal roughing plate mill. Benchboard and plug boards are located in a separate room which is supplied with filtered air, and all controller housings are of dust-tight design

and are not possible or feasible to make.

It is very seldom possible, or desirable, to adapt an a.c. controller for use on d.c. circuits, or *vice versa*.

It is impossible to modify low-voltage controllers—600 volts or less—for use on high-voltage circuits—2200 volts and above.

It is impracticable to modify high-voltage controllers—2200 volts and above—for use on low-voltage circuits—600 volts and below.

Within the limits of low-voltage designs—600 volts and less—controllers and their parts are commonly designed for 600-volt insulation requirements. Some changes of ratings within these limits are therefore both possible and practicable.

For Higher Voltages

A controller designed for a certain voltage within the low-voltage range usually can be applied on higher voltage circuits up to 600 volts. If the power requirements remain the same the full-load current at the higher voltage will be less than at the first rating. Therefore, no overheating of parts caused by overload should occur. Current coils, current transformers, power circuit resistors, and any other devices in the power circuit must be adapted to the new voltage.

Application of a controller to a power circuit of lower voltage is not readily made because the current at the lower voltage and same power requirements is higher than before and many parts of the controller will not have sufficient current-carrying capacity. Power requirements must then be at a reduced value or a controller of larger capacity must be obtained. Changes in current-carrying parts of the power circuit are to be expected even though the changed power conditions actually come within the rating of the controller being changed.

EMPLOYEE OPINION SURVEY AIDS FORD IN POLICY MAKING

For the first time in its history the Ford Motor Company has a rough chart to follow in shaping its industrial relations policies. Soon after Henry Ford II assumed the presidency late in 1945, he decided to find out how employees felt about their jobs, about their product, and about the company. To "break the ice" on that job, a set of simple questions was devised by the company's newly established industrial relations research department, and questionnaires were mailed to employees' homes.

Wanted Chance to "Vote"

The questionnaires were received with enthusiasm. Many Ford workers discussed them with their supervisors or with their neighbors on the job. A few, surprisingly, even made personal visits to the industrial relations offices. Others wrote in, saying they had not received a copy and were unable to enter their "vote." Evidently quite a number of them wondered why the company was interested in what they thought or why the company cared about their opinions.

One look at the charted answers shows something of what the net gain from it was. About four out of ten Ford workers who replied, say the company's policies have never been explained to them. About as many think that no effort has ever been made to make them feel they are a part of the company. More than one-half want some systematic way in which to reach management with their ideas.

Those are guideposts which the Ford industrial relations department recognizes. With them it is better equipped to do a job in planning and mapping future policies and programs.

The company has already changed a number of policies to meet Ford people's ideas of what they want. A special handbook for employees is now being prepared to answer many of their questions. A supervisory meeting program has been started. Everybody will get together for two-way discussions of management matters, supervisors' problems, and workers' problems.

These supervisory sessions start with a meeting of Henry Ford II and Ernest R. Breech, executive vice-president, with 60 key executives. They, in turn, pass the information on to their department heads in a series of meetings. The same type of meeting goes right on down the line to foremen. The meetings, it is hoped, will carry information from the top down to the worker in a hurry. In turn, information will feed back up the line.

To meet a third need expressed in the answers to the questionnaire, a suggestion system is being set up. It is soon to be installed in the Lincoln Plant and in several buildings of the Rouge Plant. When the bugs are ironed out, it will be extended throughout the company.

Receive Much Comment

More than 120,000 of the questionnaires were mailed to Ford workers' homes. Over 22,000, an average of 19.6 per cent, were returned and tabulated. In addition, 15,309 ballots contained written comments. Because some employees made more than one comment, the total comments reached 63,000. Three employees, in fact, wrote down 19 individual comments each.

The research department set up special classifications for these comments, and made a detailed analysis of them. They cover a wide variety of topics, and the sentiments expressed range from very favorable to very critical. They have given Ford a great deal of information.

Now that they realize that everything that came out of the survey was for the mutual gain of employees and the company, many workers are asking when they will have a chance to fill in another questionnaire. A large majority indicate that they would like this type of thing continued. They want a

1 **Do you feel you are well informed about the Company's personnel policies — what the Company expects of you and what it is trying to do for you?**

350 or 1.6% gave multiple answers; 562 or 2.5% did not answer

2 **Are you made to feel that you are a definite part of the Company—a member of the Ford Team?**

271 or 1.2% gave multiple answers; 668 or 3% did not answer

3 **Do you believe that you are given a fair opportunity to make suggestions and criticisms about Company practices and officials?**

2,105 or 9.4% gave multiple answers; 723 or 3.2% did not answer

4 **Do you believe that questionnaires of this kind serve a useful purpose?**

1,074 or 4.8% gave multiple answers; 557 or 2.4% did not answer

5 **Do you have a chance to talk over your work or ideas with your immediate superior?**

258 or 1.1% gave multiple answers; 786 or 3.5% did not answer

6 **On the whole how do you think the products of the Ford Motor Company compare with those of its principal competitors?**

251 or 1.1% gave multiple answers; 1,250 or 5.6% did not answer

chance to tell management what they think. The survey was evidently an important step in building *employee trust in management.*

One flattering result of the questionnaire was the opinion of an overwhelming majority that they were building a product as good or better than any competitor's. Eighty-six per cent of Ford workers answered "as good or better" to this question: "On the whole, how do you think the products of the Ford Motor Company compare to those of its principal competitors?"

In commenting on this, Ford said, "This gives us real satisfaction, because the best team will always be the team that believes in the product it is building."

Results of this survey were gratifying in many ways. As Ford said in a note mailed to each worker with a copy of the results of the survey:

"Critical or complimentary, your opinions are going to be most helpful in planning for better relationships."

Plan More Surveys

Along with the changes already made, and others to come, the company plans to make increasing use of such surveys. The frequency of future surveys has not yet been set. They will be, however, on many subjects related to Ford operations. One might be specifically on industrial relations, another on company policies, another on employee recreational facilities.

The company realizes it cannot create better "human relations" with questionnaires. But it can certainly get the indicators from them. And they are a very useful part of an industrial relations program based on the one idea of "getting closer to the people working for Ford."

A. The policies have been explained to me in a completely satisfactory way	5,505	24.5%
B. The policies have not been completely explained to me	7,334	32.6%
C. The policies have never been explained to me	8,710	38.8%
A. Strong efforts are made to make me feel a definite part of the company	5,696	25.4%
B. Little effort is made to make me feel a part of the Company	7,537	33.5%
C. No effort is made to make me feel a part of the Company	8,289	36.9%
A. I believe that it would be dangerous for a man to express his honest opinion here at Ford's	4,155	18.5%
B. I believe that there should be some systematic way by which we could make our views known to management directly	11,829	52.7%
C. I believe that the Company already provides sufficient means by which we may make our suggestions and criticisms known	3,649	16.2%
A. I believe that polls of this kind are extremely useful	13,949	62.1%
B. I think they may have some value	6,218	27.7%
C. I think they are a waste of time	663	3.0%
A. I am free to talk with him whenever I want	11,555	51.4%
B. I have only an occasional chance to talk with him	4,859	21.7%
C. I never have any real chance to talk with him	5,003	22.3%
A. Ford gives as good or better value for the money	19,316	86%
B. Ford gives less value for the money	1,644	7.3%

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

Loads of lap pulp are moved into boxcars on two scrap lumber sleeves which fit over forks of trucks. Man-hours required for loading boxcars have been reduced by 85 per cent

SCRAP-LUMBER SLEEVES SPEED FORK TRUCK MOVING

Loading lap pulp into boxcars presented a tough problem to the Hammermill Paper Company, Erie, Pa. By manual methods, the job required 20 man-hours to load a car; conventional pallets for use with fork trucks were thought to be too expensive.

The first attempt at improvement involved piling the laps into unit loads to be moved by fork trucks, with the load resting directly on the forks. While this was satisfactory for pick-up and moving, it was difficult to deposit the load because withdrawal of the forks often resulted in upsetting the pile of laps.

The final solution involved the use of a skid-jig and two wooden "sleeves" for the forks of the truck. Placed in the openings of the skid-jig, the forks slide into them with ease. When the load is "dropped" in the boxcar, the sleeves remain with it. This procedure simplifies removal of the load, and, since the sleeves are both light and compact, shipping charges are held to a minimum.

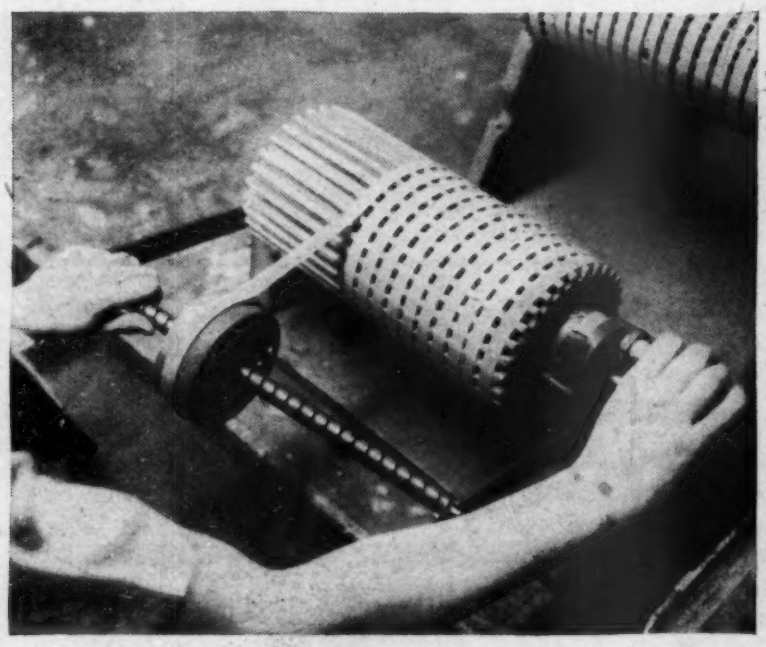
Over-all loading time has been cut to 3 man-hours per carload, a reduction of 85 per cent. And the cost of the sleeves is practically zero—they are made of scrap lumber.

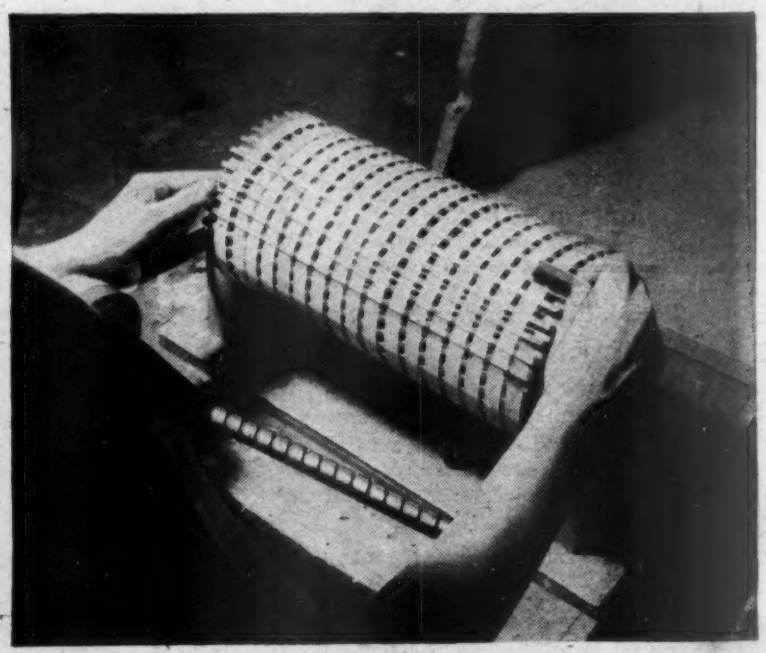
VERTICAL SEPARATORS FOR CONTROL OF STOCKPILES

An efficient and flexible arrangement of stockpiling and control has been achieved at the Central Mine Equipment Company, St. Louis, by the use of vertical separators lined up in sockets precast into the floors.

Most of the material used in this plant is in the form of rod, bar, and tube steel stock. Vertical sockets are precast in the concrete floor slabs 12 inches apart, in a line extending out 20 feet from the wall to the first traffic aisle, all down the entire length of the bay. Pieces of 1½-in. pipe are placed vertically in these sockets to separate the various types of stock and keep them lined up neatly in their piles.

The width of each section is easily and quickly varied in multiples of 12 inches to fit the type of material to be





Each day, Bendix Radio Division, Baltimore, uses hundreds of small pieces of adhesive-backed paper tape in its radio assembly. Sticky fingers, irregular-shaped pieces, difficulty in separating, picking up and putting down scissors or blade, all contributed to lost time. Now the tape is rolled onto a drum (left), cut to proper length by running a razor blade along the grooves (right). Pieces can be picked off singly with tweezers

stacked by merely moving the positions of the uprights.

On the other side of the 10-ft. traffic aisle are the cut-off machines, chamfering machines, and lathes. They are placed so that the material in the parallel stockpiles points directly into their line of feed, which eliminates unnecessary turning of the stock.

SLIDING EYE ON BAR FOR MOVING HEAVY RACKS

Frequent changes in production requirements necessitate the movement of heavy storage racks, parts bins, and other facilities used in aircraft manufacture at Ryan Aeronautical Company, San Diego. A special steel bar with sliding engagement eye has been devised which may be placed over the object to be moved and quickly connected. The hook from a traveling overhead crane can then be engaged in the sliding eye of the bar, and the whole structure rapidly lifted, moved, and placed in the new location. By means of this device, production needs are met without delay, and a flexible assembly line can be maintained.

Specially built bar, with sliding engagement eye for connection with crane hook, allows quick changes in assembly lines to meet production needs in busy plant

SPECIAL MOUNTING ISOLATES VIBRATION

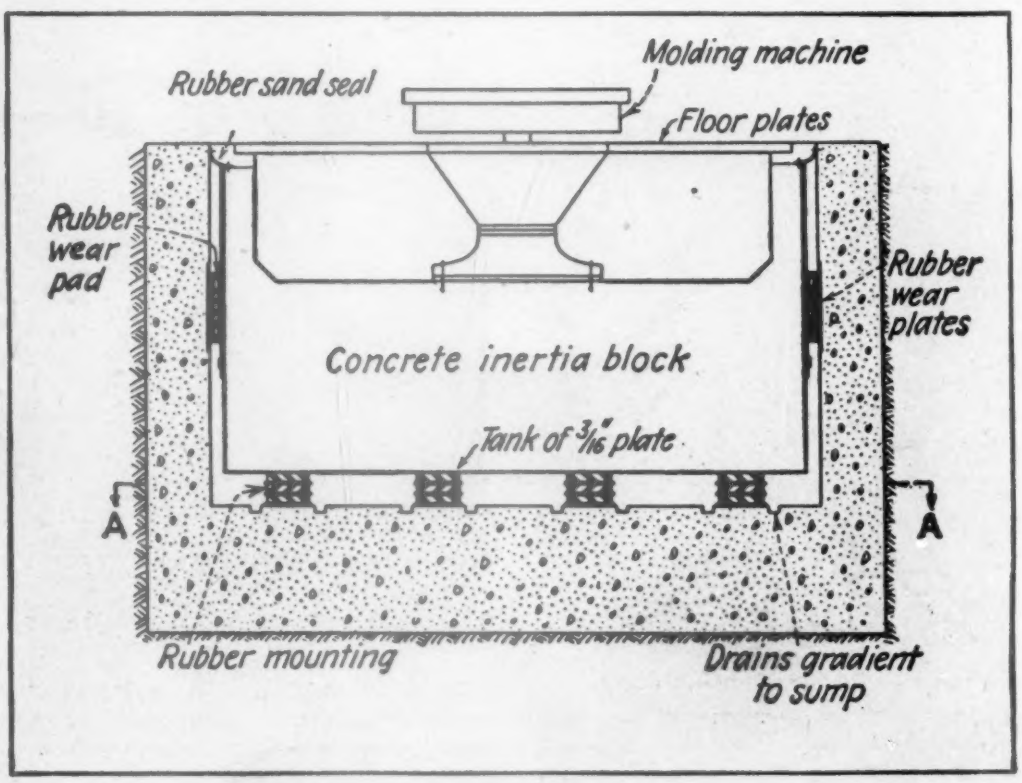
SOURCE: United States Rubber Company, New York

Shock vibrations of 13 jolt machines in the foundry of the Wood-Ridge, N. J., plant of the Wright Aeronautical Corporation are so completely isolated by special rubber mountings that sensitive

laboratory instruments less than 50 yards away can be operated without interference.

These jolt machines, weighing from 3000 to 22,000 pounds, jolt the sand molds rapidly up and down by pneumatic power to get the sand to pack closely around the patterns. The gross weight of a flask and jolt table ranges from 3 to 5 tons. Without special mountings, operation of the jolt machines would create impact vibrations of such violence as to invite fracture of building footings, interfere with machines working to close tolerances, and disturb office and engineering workers.

Cross-sectional design of the special mountings is shown in the sketch. Each machine is secured to a large concrete inertia block which rests on rubber mountings. Some of the blocks weigh as much as 40,000 pounds. All blocks are recessed in pits so that the base of each machine is at floor level. Isolation of vibrations is so effective that all 13 machines may be operated in unison without setting up vibrations.



FIRE PREVENTION BOOKLET FOR WORKERS

Treating the subject in concise, easy-to-understand language, illustrated by humorous sketches, The B. F. Goodrich Company, Akron, has published an attractive four-page folder for its employees on "Fire Prevention." The folder is part of the series of instructive printed pieces issued for workers by the company's good housekeeping organization.

After briefly reviewing the tremendous fire losses in the United States during 1946, and pointing out a few simple preventive measures, the leaflet graphically illustrates principal steps to take in case of fire, and describes various types of extinguishers,

showing how they should be used. Cartoon treatment of some of the principal conditions that cause fires add a light touch.

POWER TRUCKS SPEED BOXCAR LOADING

In loading boxcars with coils of wire at the Laclede Steel Corporation, Alton, Ill., savings of 75 man-hours per car have been realized by the change from manual transportation to the use of power trucks.

For each 100 man-hours required by the old hand trucking method, a power truck with ram attachment requires only 25 man-hours. In addition, fatigue and accidents have been lessened by the elevation of the ram bearing the coils to a level where the only manual movement of the wire is horizontal.

Some types of wire are shipped in barrels. These barrels weigh 600 pounds each. Previously they were handled one at a time by a man with a two-wheeled hand truck. Now the barrels are placed on pallets and the power truck, with fork attachment, carries six at a time. Thus one worker handles six times as many barrels per load, and less trucking time is required because of the faster movement of the truck.

Previously these barrels of wire coils, each weighing 600 pounds, were handled one at a time on a two-wheeled hand truck. Now this 6000-lb.-capacity fork truck handles six barrels in a pallet load

SALVAGE CLOTHS MINIMIZE FIRE-SPRINKLER DAMAGE

STANLEY BROWN, Superintendent of Maintenance, Esterbrook Pen Company, Camden, N. J.

Where fire protection is developed to a high degree, as it is at Esterbrook Pen Company, the fire damage to the product will probably be negligible compared to the damage caused by the flood sprinkler action. Accordingly, a plan for the protection of steel pen points and other work in process against water damage has been devised.

Located on the walls at ten key points throughout the three-story plant are red cabinets, each with a large front-opening hinged door, containing rubberized sheets about 9 feet square. These cabinets are about 15 inches square and 6 inches deep, and are marked "Salvage Cloths" in yellow lettering 2 inches high.

Whenever a fire alarm rings, indicating the section of the plant where the threat of a fire exists, a brigade of five men proceed immediately to this location, and cover all water-perishable work in process with the salvage cloths.

Rubberized salvage cloths, stored in wall cabinets placed at strategic points throughout the plant, are used to cover water-perishable work in process when fire threatens, to protect it from sprinkler damage

SAFETY "DO'S" FOR MACHINE OPERATORS

It's "do" instead of the customary "do not" at Lyon Metal Products, Inc., Aurora, Ill. The following safety rules, protected by cellophane and framed in an orange metal holder, are displayed on each machine in the plant:

1. Do be careful of your hands and fingers. Keep them away from punch and die while flywheel is in motion.

2. Do watch your hands when you change or add more punches to a breaking die. Reaching through the machine to set gages is "bad medicine."

3. Do keep head up when lowering machine—standing in front of bar can mean trouble.

4. Do pull a press down from the back—pulling it forward is dangerous.

5. Do use a tool or stick for placing work in die—fingers are too valuable.

6. Do watch what you are doing in operating your own press. Star-gazing is unhealthy.

7. Do wear goggles when working on grinder, emery wheel, or spot welder.

8. Do wipe up oil on floor before you or someone else slips and falls.

9. Do keep aisles clear — concrete floors make hard falls.

10. Do use a lead hammer on a die. Flying splinters are dangerous from a regular hammer.

11. Do protect your eyes by refusing to use battered chisels.

12. Do report unsafe tools or equipment to your foreman. Do your part to protect priceless fingers, hands, and eyes. Substitutes are not so good.

BARRETT-CRAVENS
POWER-OX LIFT TRUCK

DEPENDABLE

POWER

CUT MATERIALS HANDLING COSTS
MOVE MORE GOODS WITH SAFETY

You can do both ... and MORE ... when you use
EXIDE-IRONCLAD POWERED Electric Trucks

Wherever goods are lifted, hauled and stacked, efficient battery electric trucks and Exide-Ironclad power are effecting important economies all along the line. They do more work per man per hour and at less cost. They do it with greater ease and safety. And they maintain a steady pace straight through to the end of every shift.

Exide-Ironclad batteries have the high power ability, the high maintained voltage and the high capacity that materials handling demands. You can always count on Exide-Ironclad batteries for dependability, long life and ease of maintenance.

Write us for a FREE copy of "Exide-Ironclad Topics" which contains "Case Studies" of materials handling problems. It tells how to cut handling costs, up to 70%. It covers latest developments in handling materials from receiving to shipping.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 20
In Canada, Toronto 9

BARRETT-CRAVENS
POWER-OX LIFT TRUCK

management data sheet 9

MERIT RATING FUNDAMENTALS

1. Purpose of Merit Rating

a. Merit rating is a tool of management which is used to determine the relative merit of individual employees, as an aid in making decisions regarding pay, training, transfers, promotions, and dismissals.

2. Fields of Application

a. Merit rating may be applied to all levels of an industrial organization.

b. In actual practice, it is more generally applied to the lower levels of hourly rated or salaried occupations, but its use is more effective when applied throughout the organization.

3. Principles of Merit Rating

a. Merit rating consists of determining the relative merit of individual employees on the basis of an analysis of each employee with respect to certain factors.

b. These factors represent desirable characteristics which are considered important in the attitude of the employee and in the execution of his work.

c. Factors considered in this data sheet include quality of work, quantity of work, cooperation, initiative, dependability, job knowledge, and attendance.

d. For each factor, a scale of points is established, representing a yardstick that is used to measure the factor.

e. Because some factors are more important than others, a separate scale is established for each factor, so that the more important factors may be credited with additional points.

f. In the analysis of an employee, each factor is considered separately, and each scale is applied to measure the degree in which the employee meets the requirements of the specific factor, with the corresponding point value credited to the employee.

g. The sum of the points credited for all factors represents the relative merit of the employee, and is used to make decisions regarding his rate of pay, training required, and possible transfer, promotion, or dismissal.

h. As a guide in making decisions regarding individual employees, divide the total range of maximum points for all factors into five groups.

i. Employees with points within the lowest group may be considered for immediate dismissal, following a conference giving reasons for the dismissal.

j. Employees with points within the next higher group may be considered for a decrease in rate within the rate range, or transfer to an occupation in a lower labor grade, following a personal conference specifying reasons for the action to be taken.

k. Employees with points within the middle group represent average employees doing satisfactory work, but they are not eligible for an increase, and a personal conference should be held between the employee and his superior, to indicate what improvements are expected of the employee to qualify for a rate increase or occupational advancement.

l. Employees with points within the next higher group may be considered for a rate increase within the rate range, or transfer to an occupation at the same level to broaden their qualifications, following a conference between the worker and his superior, encouraging him to continue the good work.

m. Employees with points within the highest group may be considered not only for a rate increase but also for promotion to an occupation at a higher level, following a personal conference between the employee and his superior, to discuss possible promotions and the worker's preferences.

4. Merit Rating Factors

a. Factors frequently used for merit rating include: (1) Quality of work; (2) quantity of work; (3) cooperation; (4) initiative; (5) dependability; (6) job knowledge; (7) attendance.

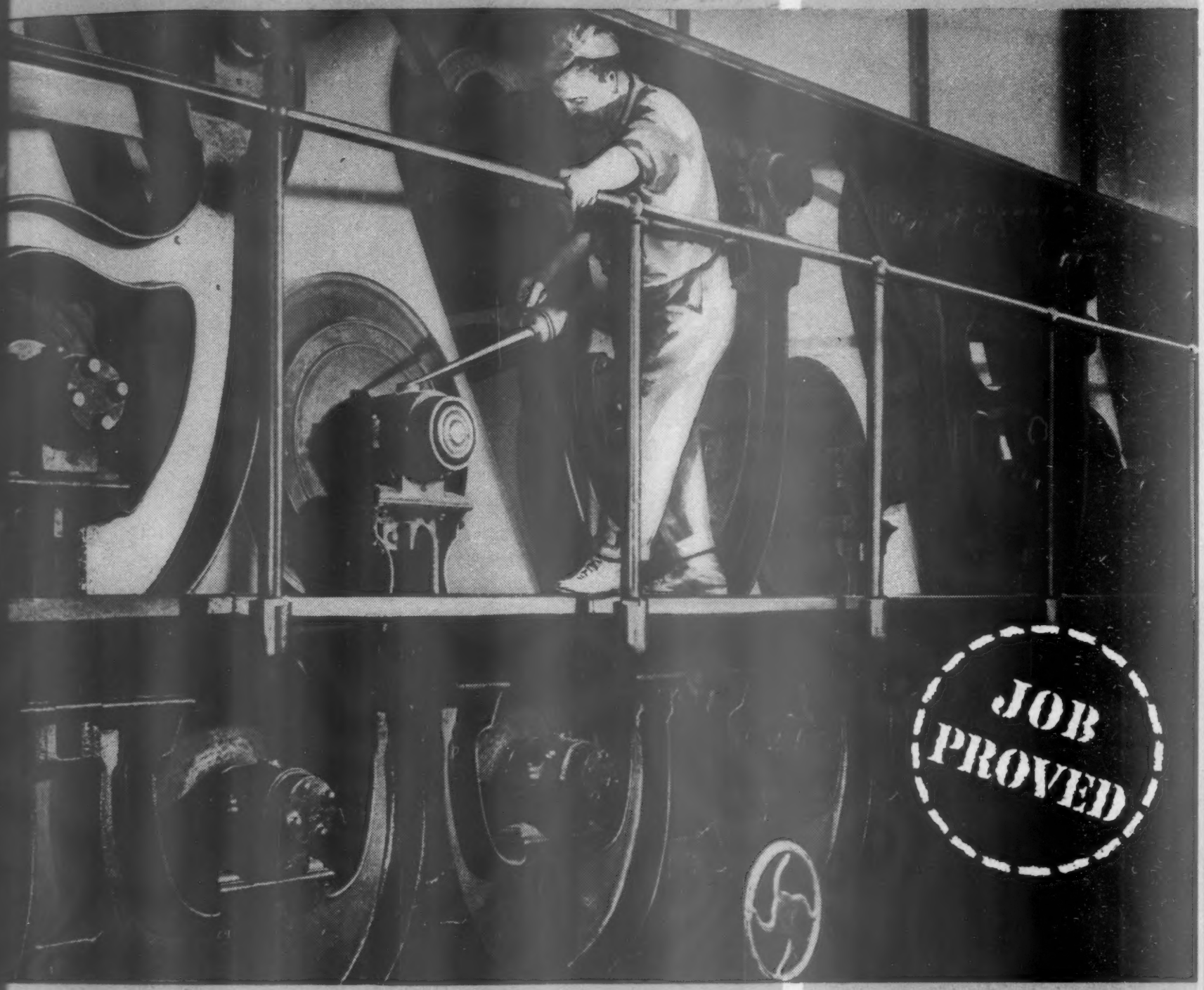
b. Each factor is defined, and divided into five degrees—low, below average, average, above average, superior—and a point value is applied to each degree.

c. Under *Quality of Work* factor, consider ability to maintain a high degree of accuracy. Degrees range from "Low—definitely unsatisfactory, extremely inaccurate, very high scrap, waste, errors," which carries a rating of 0 to "Superior—splendid work, highest quality, minimum scrap, waste, errors," with 20 points.

d. *Quantity of Work*, defined as amount of good

Prepared by Bruno A. Moski, Jr., Production Superintendent, The American Paper Goods Company, Kensington, Conn.

Ends Chronic Bearing Trouble



SUN BEARING LUBRICANT...

Eliminates Need for Frequent Dismantling

A big mill, making paperboard, was being slowed down by lubrication trouble on the drier rolls. Carbon accumulated regularly in the ring-oiled bearings, causing the rings to stick. As a result of improper lubrication, power consumption increased. The bearings had to be dismantled frequently. Meanwhile production stopped and maintenance costs piled up.

A Sun Engineer recommended a lubricant that had been "Job Proved" in dozens of paper mills. With this oil, the trouble stopped and carbon practically disappeared.

A labor saving of about 500 man-hours per year, plus an annual saving of $320 on oil, has resulted, and more continuous production has been possible. This is a typical example of how Sun Lubricants keep production up and costs down.

In mills, mines, factories wherever machines are operated, you'll find Sun Engineers and Sun "Job Proved" lubricants at work. For full information call your nearest Sun office. Or write Department F-6.

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INDUSTRIAL PRODUCTS

work produced, runs from an 0-point value of "Definitely unsatisfactory, extremely slow, does not approach standard requirements," to a 20-point value of "Extremely productive, exceeds standards by large margin."

e. Under *Cooperation* consider attitude and ability to work with others as a team. Degrees range from "Does not work well with others, inclined to make trouble"—0, to "Always cooperates cheerfully, inspires cooperation in others"—10.

f. *Initiative* is the ability to go ahead with work without direct supervision. The highest degree, "Exhibits initiative to marked degree, develops and installs new methods," rates 10 points.

g. *Dependability*—reliability in doing what is required at all times—in its highest degree, "Highly dependable and thorough, can always be relied upon," also rates 10 points.

h. *Job Knowledge*. Consider present knowledge and ability to learn new methods and related jobs. Degrees range from "Does not understand own work," 0 points, to "Understands all jobs in the department, handles new duties quickly," 10 points.

i. *Attendance*. In this factor, regularity of attendance and attitude of worker toward lost time are considered. The low point score, 0, is for "Takes advantage of every opportunity to take time out"; superior, 20 points, is "Always on the job, despite exceptional occasions for absence."

j. In each factor, the full range from "low" to "superior" is actually present in every occupation, even though the occupation itself may be in a very low or a very high labor grade.

k. In other words, the standard of quality for sweepers contains characteristics which are entirely different from those considered for toolmakers, yet individual sweepers and toolmakers may both be rated "low," "below average," "average," "above average," or "superior."

5. Merit Rating Procedure

a. It is generally desirable that all employees be reviewed for merit rating purposes twice a year, with definite dates established for each rating period.

b. Each employee should be reviewed by his immediate superior, who is generally a foreman or department head.

c. It is desirable that the personnel department provide each foreman and department head with a merit rating chart for each employee.

d. Each foreman should consider each employee carefully, and check the degree of each factor that most closely corresponds to his characteristics.

e. As the rating is intended to describe the average or usual performance of the employee, any special or unusual occurrence should not be considered.

f. The foreman should then apply the proper point values to the various factors, and develop the over-all point rating of each employee.

g. The foreman should consider action to be taken in each case, on the basis of the principles expressed in Items 3h to 3m.

h. With the use of the merit rating chart, it is suggested that the totals of the five groups of point scores be considered as including 0 to 12 (low), 13 to 36 (below average), 37 to 63 (average), 64 to 88 (above average), and 89 to 100 (superior).

i. After determining action to be taken in each case, the foreman or department head should review his recommendations with his superior, to insure that the proper decisions are made.

j. Upon completion of the action taken, the merit rating charts should be returned to the personnel department, for permanent filing in the folders for individual employees.

k. Throughout the entire procedure, all ratings should be considered confidential.

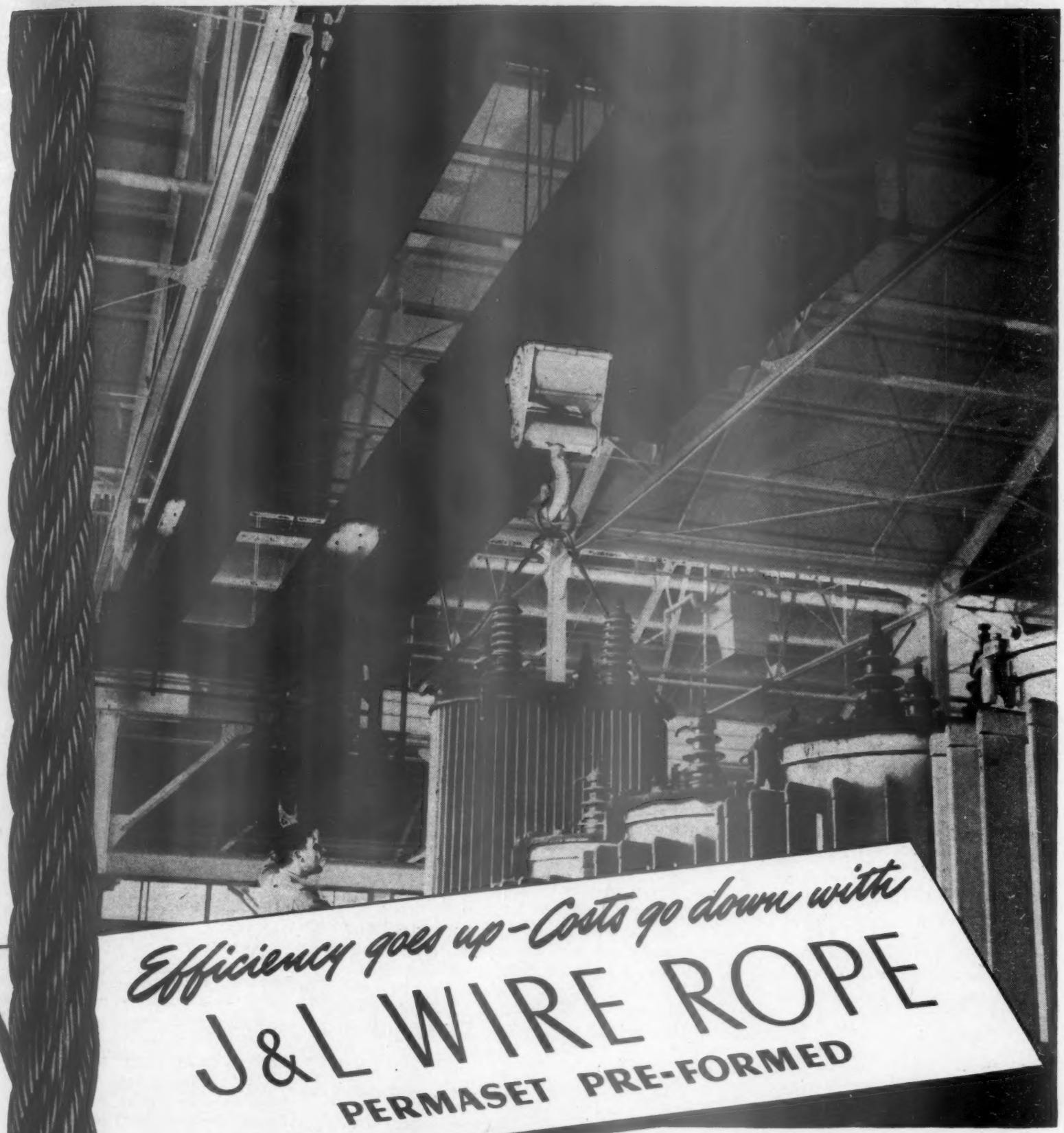
6. General Remarks

a. It is noted that a representative group of employees usually contains approximately 50 per cent of the employees at the midpoint of the rate range, representing the average employees, approximately 25 per cent at the bottom of the range, representing the employees below average, and approximately 25 per cent at the top of the range representing the employees above average.

b. Foremen and department heads should be cautioned to avoid rating the great majority of their employees at the top or bottom extremes.

c. When the normal distribution curve is kept in mind, it usually follows that equitable action is taken with regard to employees who are definitely below or above average.

Prepared by Bruno A. Moski, Jr., Production Superintendent, The American Paper Goods Company, Kensington, Conn.



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PERMASET PRE-FORMED

Large or small, few or many—the efficiency and safety of your cranes and hoists are determined by the service life of the wire rope used. Maintenance costs on your equipment, measured in ton-miles or hours of operation, can be reduced by using the best wire rope—J&L Precisionbilt Permaset Preformed Wire Rope. Our engineers will be glad to survey your equipment and make recommendations that will reduce your costs. Write today for complete information.

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GILMORE WIRE ROPE DIVISION

PITTSBURGH 30, PENNSYLVANIA

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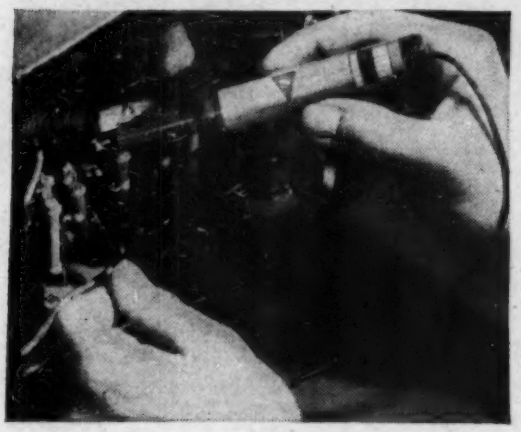
WHAT'S NEW IN EQUIPMENT

ELECTRONIC CIRCUIT TESTER

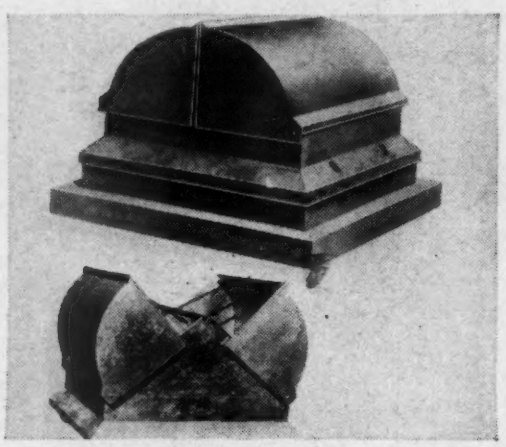
Pocket-sized ohmmeter has been developed for spot checking electronic circuit components, relays, generators, starters, and other electric equipment. The instrument is enclosed in a tubular



plastic case. Prod tip base and top cap, constructed of molded bakelite, are mounted in a transparent cellulose acetate tube housing the meter. Direct readings between 0 and 10,000 ohms are given on a 1.5 milliampere full scale sensitivity Weston meter in series with a 1000-ohm molded carbon resistor and a standard penlight dry cell. Test electrodes include a stainless steel prod built into meter case and one secured to the tip of a 17-in. test cord. Radio Tube Div., Sylvania Electric Products Inc., 500 Fifth Ave., New York 18.

ROOF VENTILATOR

Straight-through type, powered roof ventilator is made in five sizes with a range of capacities. Named Ject-O-Valve, it uses a propeller type fan to



exhaust heat, smoke, and fumes through a divided top which opens and closes automatically. The ventilator is weathertight. The Swartwout Co., 18511 Euclid Ave., Cleveland 12.

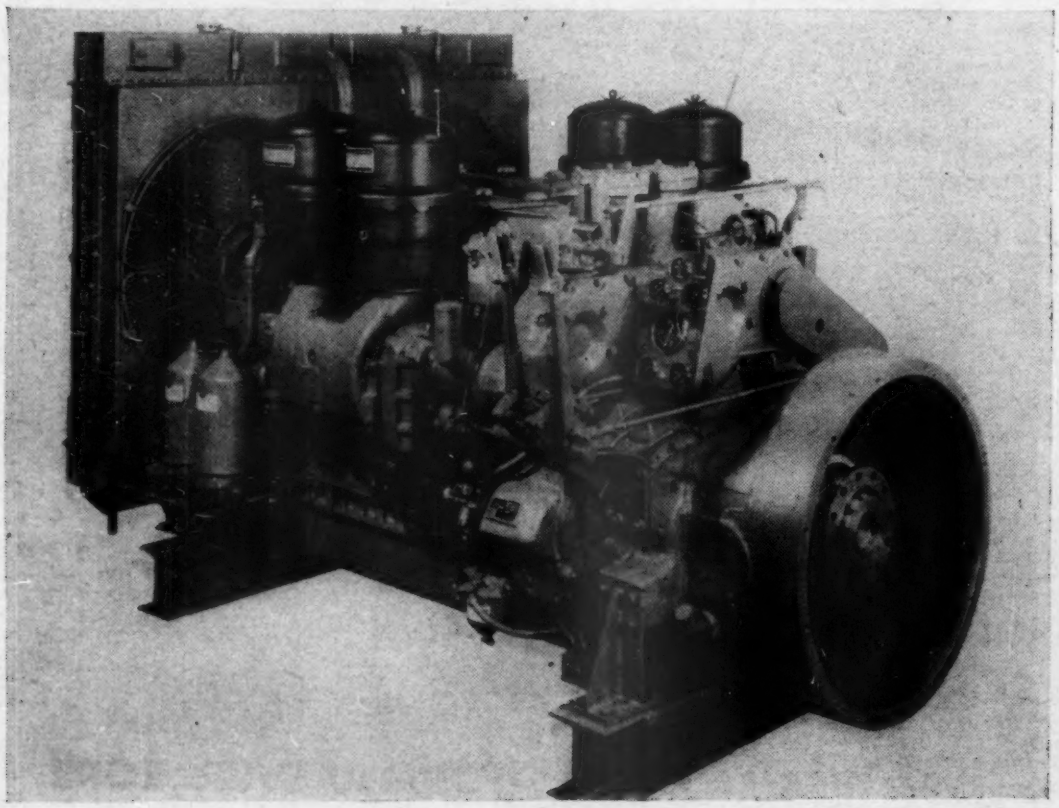
AIR COMPRESSORS

Two-stage, air-cooled stationary air compressors, called Unitair, are available in nine sizes with power requirements ranging from 15 to 100 horsepower, piston displacements from 81 to 590 c.f.m. at 100 p.s.i. discharge pressure, based on

60-cycle motor speeds. The three standard electric drives include built-in motor, direct-connected motor, and V-belt drive. The units may also be equipped for use with gasoline or diesel engines. Features include force-feed lubrication, oil cooling, low-lift large port area, direct concentric valves, low piston speeds, oversized ball-type main bearings, and four piston rings per piston mounted above the pin. Sullivan Div., Joy Mfg. Co., Oliver Bldg., Pittsburgh 22.

DIESEL ENGINES

Each unit in Series 71 "Twin 6" diesel engines is made up of two basic 6-cylinder, 2-cycle engines mounted side by side and geared to a single shaft. Units are offered with either right- or left-hand rotation. Any one of four different transfer gear types can be selected, with gear ratios of 1:1 direct drive, and 1.33:1, 1.77:1, and 2:1 reduction. Engine units can be obtained with either radiator or heat exchanger cooling systems. Detroit Diesel Engine Div., General Motors Corp., 13400 West Outer Drive, Detroit 23.

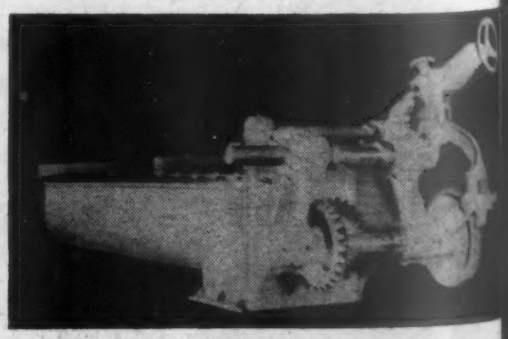


CLEANING COMPOUND

Whiz Unifoam Concentrate is the name of a highly concentrated liquid cleaner combining a vegetable oil base with a wetting agent. It can be used on all types of floors, floor coverings, painted walls; it is soluble in hot or cold water, and it lathers freely and will not streak or leave a film, maker says. Also can be used as a hand soap. R. M. Hollingshead Corp., Camden, N. J.

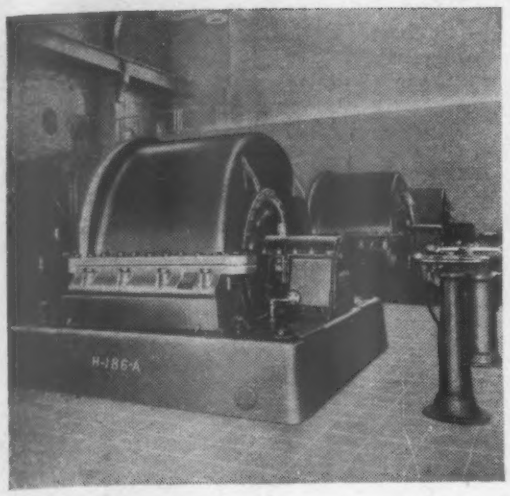
FEEDER DRIVE

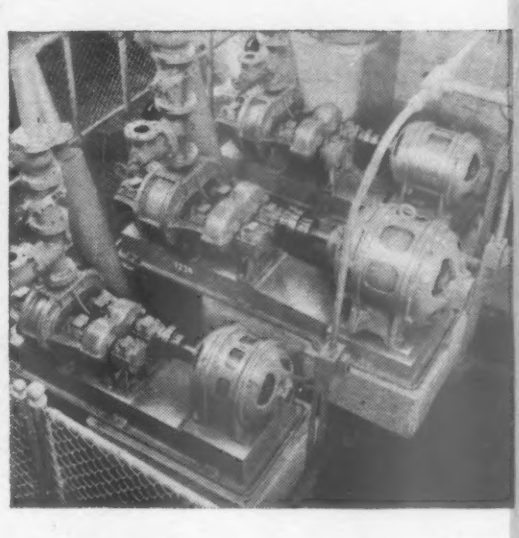
Heavy-duty Type 2520 variable speed feeder drive is designed to handle the extra load and high capacities required by most wide-mouth feed bins, insuring



a continuous, uniform stream of free-flowing material. Wide babbitted and bronze bushed bearings seat large diameter drive shafts. Speed adjusting

R-C *dual-ability* DEVISES *Wind-makers* TO GUARD WATER SUPPLIES!





Safe, clean water usually depends upon the protection of supply sources through sewage purification. Many modern plants use Roots-Connersville Blowers to help remove impurities and thus allow the resultant purified water to be returned to lakes and streams for re-use by homes and industries.

The same R-C *dual-ability* which devises these essential blowers is responsible for the successful, dependable performance of man-made "wind-makers" in practically every industry and in a wide variety of applications. Our capacity to supply either Centrifugal or Rotary Positive types enables us to meet the exact needs of each installation, without prejudice.

Advanced engineering, plus almost a century of blower building experience, enhances the value of this completely independent thinking. The result is that R-C Blowers fit the job and can be relied upon for many years of economical, trouble-free operation.

ROOTS-CONNERSVILLE BLOWER CORP.
706 Central Ave., Connersville, Indiana

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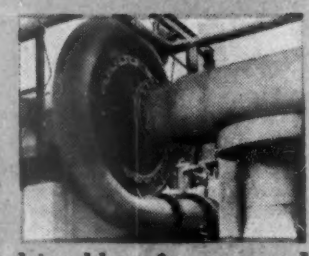
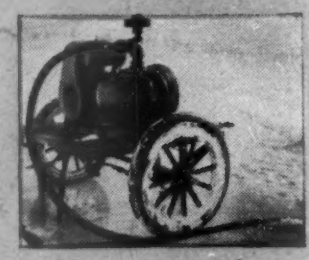
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS
BLOWER BUILDERS R-C SINCE 1854
★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

WE MOVE AIR OR GAS IN ANY QUANTITY FOR ANY INDUSTRY



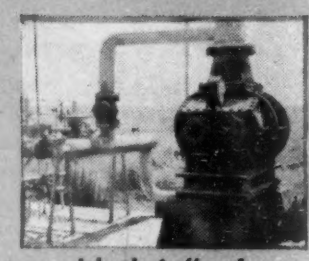
Centrifugal Blower

Used in oil refining, 11,750 CFM. capacity. Similar R-C Blowers are widely used in foundries, blast furnaces and other industries requiring high capacity equipment for boosting or exhausting air or gas.



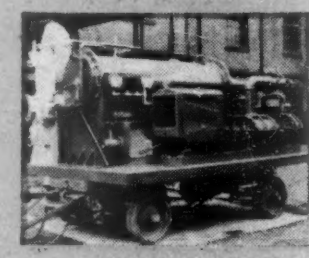
Rotary Positive Blower

Compactness of R-C Blowers suits them to many kinds of built-in applications. This portable aerator, with gas-engine drive, supplies air to fish in hatchery ponds, when the surface is entirely frozen over.



Positive Displacement Meter

Measures and records gas furnished by a public utility to an industrial consumer. R-C Meters with their "cash register" accuracy, measure or proportion any quantity of air or gas up to 1,000,000 CFH.



Inert Gas Generator

Provides protection, economically and efficiently, against fire and explosion hazards, where inflammable gases or liquids are processed or handled. Standard blower and gas pump are incorporated in unit.

• • •

R-C *dual-ability* will help you select the right air or gas handling equipment for your specific needs. Consult us without obligation.

MAIL THIS COUPON WITH YOUR LETTERHEAD

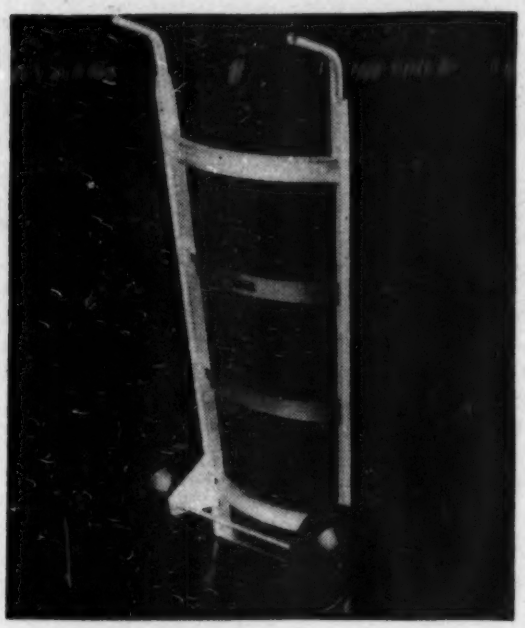
Roots-Connersville Blower Corporation,
706 Central Avenue
Connersville, Indiana
Please send information on:

BLOWERS_____ EXHAUSTERS_____
VACUUM PUMPS_____ METERS_____
BOOSTERS_____ LIQUID PUMPS_____
INERT GAS GENERATORS_____
NAME_____
TITLE_____

mechanism provides an even rate of discharge. Includes heavy steel-tipped pawls and wide non-slip ratchet wheel. A self-contained unit, the drive bolts directly to conveyor box end, and requires no intermediate coupling. Capacities, operating speeds, and horsepower are based on individual application. Sprout, Waldron & Co., Muncy, Pa.

HAND TRUCK

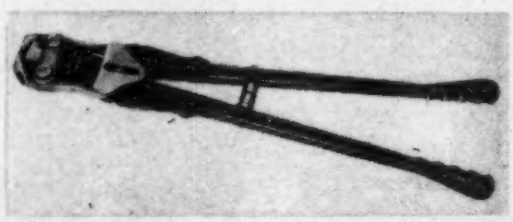
All-welded steel hand truck has rubber-tired ball bearing wheels and a large nose plate. Handles are made of curved



¾-in. pipe. Curved or straight back permits handling loads up to 500 pounds. Over-all height of the truck is 51 inches. It is 19½ inches wide at top and 14½ at the nose. Weight is 43 pounds. Sage Equipment Co., 110 Auburn Ave., Buffalo 13.

CUTTING TOOL

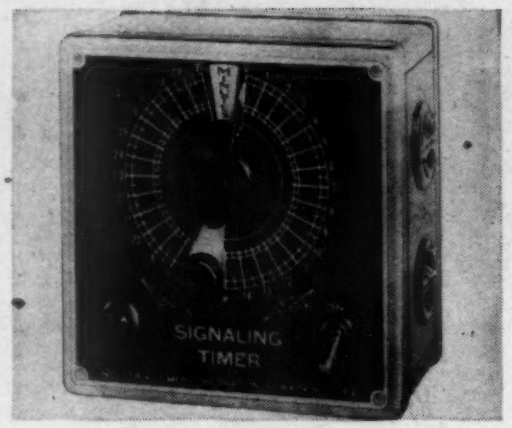
Carolus type cutter is made with drop forged handles and socket screws in the adjusting sections. Countersunk eccentric head strap bolts maintain factory set tension on the head assembly.



Cutting jaw provides both side and end cutting action. Also available in a 3-way combination incorporating a nut splitter. Through compound leverage, the application of 100-lb. pressure gives 4-ton cutting power at the jaws. The tool is designed to cut all metals up to the hardness of case hardened steel. Manco Mfg. Co., Bradley, Ill.

SIGNALING TIMER

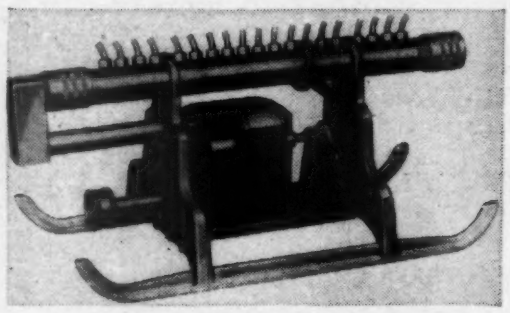
Designed to command visual and audible attention when a time interval is completed, Series S signaling timer provides for the automatic closing or opening of a circuit at the end of elapsed time, and operates additional buzzers, bells, or



lights at remote locations. Pointer on the timer is manually set to the required interval shown on the dial. The timer is enclosed in a metallic case which can be attached to any wall, panel or standard switchbox. Operates on a.c., 115 or 230 volts, 25, 50, or 60 cycles, voltage and frequency to be specified. Motor is slow speed, self-starting synchronous type. Industrial Timer Corp., 110 Edison Pl., Newark 5, N. J.

SPRINKLER

Called Shower-Queen, sprinkler has an oscillating shower bar which operates in a trajectory arc of 150 degrees, delivering water in the amount of 300 g.p.h. over an area of 50x65 feet. Adjustment of the spray-bar permits placing the sprinkler adjacent to any building, to irrigate the area from the building outward, and the unit may be located near sidewalk edge without spraying passers-



ly. Areas of various sizes can be covered by reducing water pressure at the faucet. The sprinkler is of non-rusting metal, has centrifugal hydraulic type motor, and wide sled-like runners. Acme Sprinkler Co., 412 Walbridge St., Kalamazoo 3, Mich.

ELECTROLYTIC CAPACITORS

Constructed for convenient incorporation in the motor housing, electrolytic capacitors are provided in round metal cases in three sizes for use in starting

circuits of 110- and 220-volt a.c. motors. In the 110-volt rating, available capacitances range from 20 to 420 microfarads; in the 220-volt rating, from 20 to 60 microfarads. Operating temperature range is from 76 to 185 deg. F. The 2-in. case is furnished with screw terminals taking a 10/32 screw. The 1⅜-in. case has solder lug terminals with ⅛-in. lead clearance. Tobe Deutschmann Corp., Canton, Mass. •

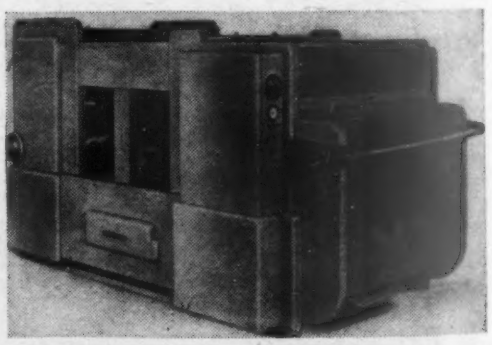
DRAFT GAGE

Designed for use on every type of heating plant, draft gage Model MZF is supplied with 9 feet of rubber tubing and a 5-in. metal sampling tube. It can be used for readings at the point of draft

measurement, or placed any distance away from the test point. Adaptable for panel, wall, or flat surface mounting. Large area diaphragm enclosed in a metal housing is said to assure sustained accuracy and trouble-free service. Other features include a 3-in.-wide scale, zero adjustment that can be made without removing any parts, and a range of 0.25 inch. Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8.

BLUEPRINTING AND FINISHING MACHINES

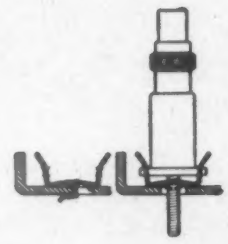
Utilizing a revolving contact principle for slip-free, static-free contact between the tracing and sensitized material,

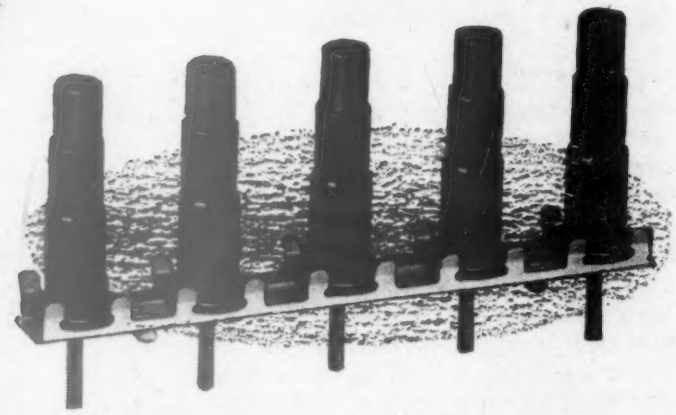


Type M4 machine is designed for automatic high-speed production of blueprints, whiteprints, vandyke prints, and blueline prints. It is equipped with a 75- or 95-watt quartz lamp, and drive mechanism provides an infinite number of speeds from 6 inches to 32 feet per minute. Material is carried through the machine by auxiliary feed and contact belts. Also available is a finishing

THIS IS A SPEED NUT*

and





THIS *is also a* SPEED NUT

It looks more like a caterpillar than a nut, doesn't it? But a nut it is . . . or rather, five SPEED NUTS combined into one, to simplify and improve the assembly of multiple coil forms on radios.

This one ingenious fastener replaced eight separate parts formerly used and eliminated expensive drilling and tapping operations. It retains the tuning cores and screws, provides exactly the right tension on the screws, and its spring arms hold the plastic coil tubes securely in place.

This is just one example of hundreds where the basic SPEED NUT principle is applied to develop a special fastener for better, more economical assembly. SPEED NUT brand fasteners may be the answer to your quest for lower assembly costs, so be sure to investigate these streamlined fastening devices. Write us today, including engineering details, and we'll give you a complete, no-charge analysis.

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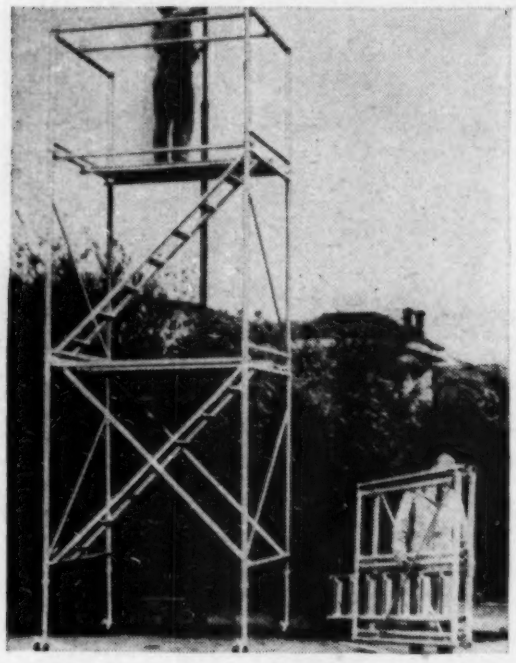
MORE THAN 4000 SHAPES AND SIZES

FASTEST THING IN FASTENINGS

machine for processing ammonia type diazo white prints. Uses perforated stainless steel rollers, and is equipped with diaphragm pump, an interval timer for temperature control, and single switch control. Paragon-Revolute Corp., FMM, 77 South Ave. Rochester 4.

PORTABLE SCAFFOLD

Aluminum alloy scaffold can be erected or taken down by one man in a few minutes. There are no loose pieces, nuts, or bolts. Each section is a complete unit, folding flat to 6½ inches thick, and



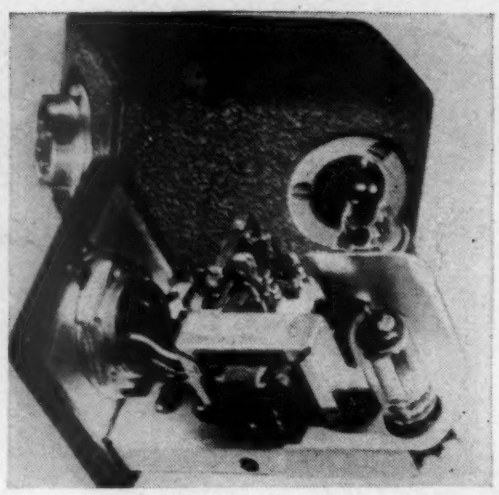
weighing 56 pounds. Once erected, the scaffold can be moved along the ground or floor to different jobs. The platforms are of waterproof plywood, and guard rails protect the worker. Adjustable legs provide a solid foundation, and level the scaffold on uneven ground. The scaffold is 4½ feet wide and 6 feet long, and each working platform is 2 feet wide and 6 feet long. The double unit has the "reach" for most two-story work and the triple for three stories. Up-Right Scaffold Co., Bank of America Bldg., Berkeley 4, Calif.

FUME-RESISTANT ENAMEL

Designated Fumex, enamel, consisting of a polymerized thermoplastic elastomer produced from an olefinic base, is resistant to alkali, acid, and sulphide fumes. It can be used on brick, concrete, plaster, wood, and metal interior surfaces. Prime virgin or badly yellowed surfaces are treated first with Fumex Undercoater. The enamel is supplied in white only, semi-gloss finish, in brushing consistency. Turpentine thinners are needed for spray application. Washable, it will not chip or flake when properly applied, according to the manufacturer. A. C. Horn Co., Inc., 43-36 10th St., Long Island City 1, N. Y.

RELAY

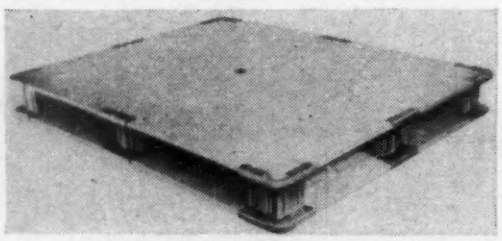
Quick change to save production time is the feature of a photo relay with mount which plugs in mounting stands made in varying heights from 12 to 34 inches. Relay is held by a locking ring which



screws from the base onto the mount. Built for primary supply voltage of 115, 50/60 cycle a.c., output connections of a single pole double throw switch, silver contacts rated at 5 ampere noninductive load. Screwdriver adjustment provides sensitivity control for optimum operation at distances up to 35 feet. Speed is 1/20 second for operation, ½ second for release. A high-speed unit may be obtained with 1/20 second for both operation and release. Special Products Co., Silver Springs, Md.

PALLET

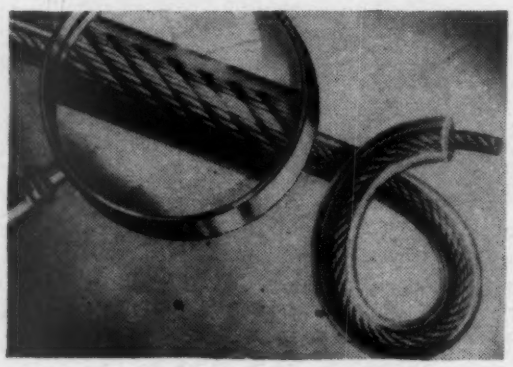
Constructed with ⅝-in. plywood decks, and posts of plywood blocks, pallet is double-faced, for 4-way fork entry. Also can be made with metal posts for use with hand-lift or motorized pallet trucks. Unbroken, splinterless surface minimizes damage to the material load. Sizes range



from 30x40 inches with 1-in. vertical clearance, and weight of 36 pounds, up to 48x60 inches with 3¾-in. clearance, weighing 89 pounds. Capacities are 4000 pounds carrying load, and 16,000 pounds static load. Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.

NYLON CABLE

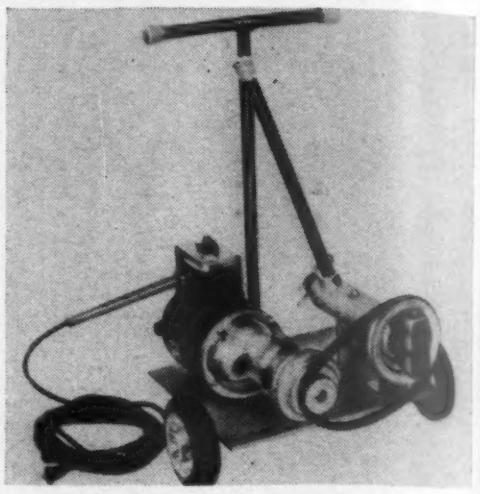
Consisting of a 3/32-in. aero steel wire rope core (of 920 pounds break test) impregnated with extruded nylon, cable is claimed to withstand 320,000 flexings before the steel core breaks, and 410,000 before the nylon severs. According to the



manufacturer, the cable is highly resistant to oils, acids, moisture, salt water, friction, and fire, and will not fray, rust or rot. Available in 6/32- and 7/32-in. o.d. sizes. The Danielson Mfg. Co., Danielson, Conn.

PIPE CLEANING MACHINE

Featuring portability, speed in pipe and sewer cleaning operations, and operator safety the Flexi-Cleaner utilizes electric power to unblock stopped lines. The machine includes malleable vise-grip jaws, rubber hand grips, standard-size belt, Browning 3-speed cone pulleys, Goodrich solid rubber-tired roller-bearing



wheels, 3-wire ground electric cord, bronze and needle bearings for friction parts. The reversible ½-hp. motor is designed for universal a.c. or d.c. (110-volt, 50-60-cycle) operation. Flexible Sewer-Rod Equipment Co., 9050 Venice Blvd., Los Angeles 34.

OIL PRESSURE CONTROL

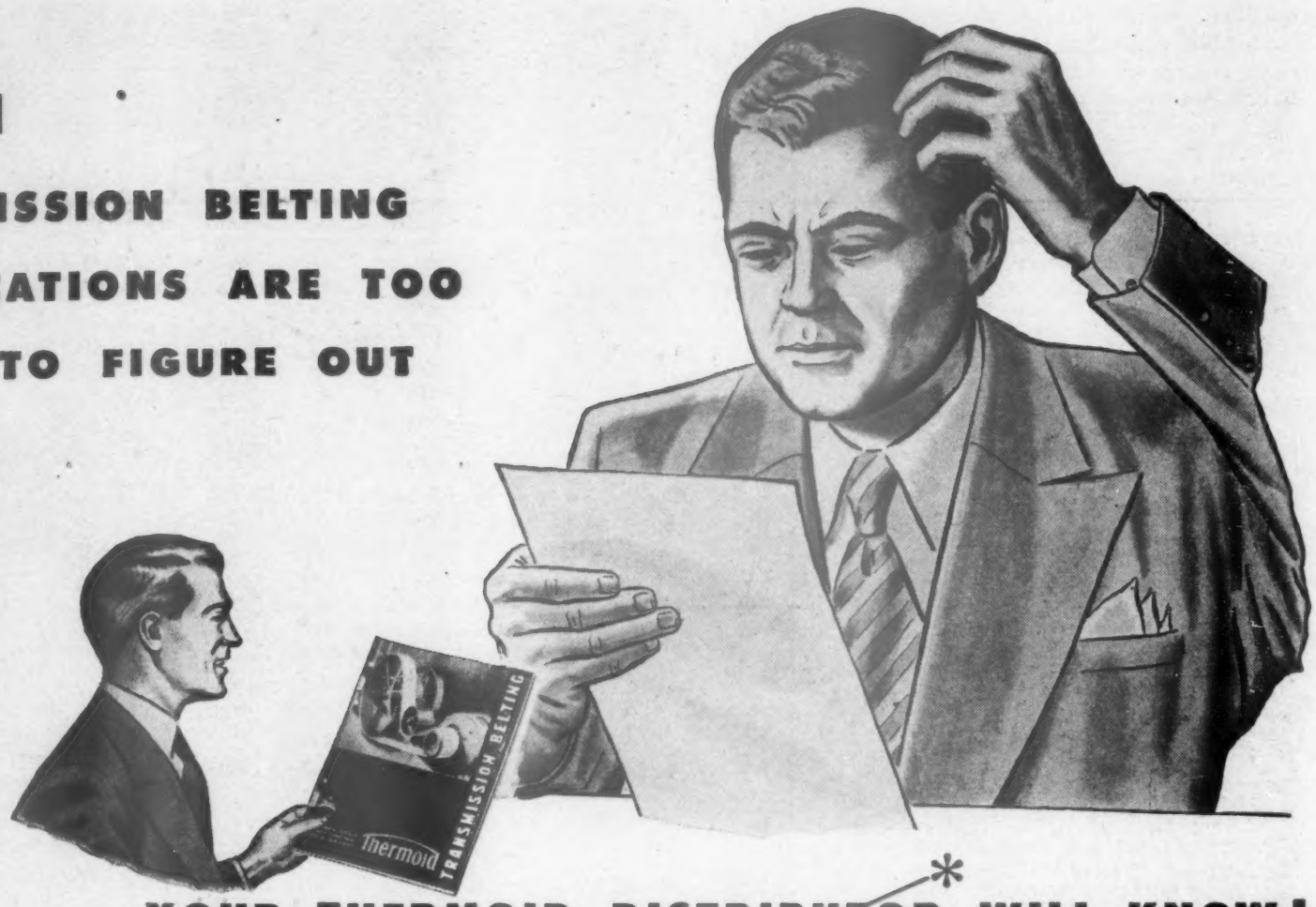
Machine and engine breakdowns and costly repairs caused by pressure lubrication failures are claimed to be largely eliminated by an oil pressure-activated safety mechanism. Installed in the lubri-

cation system, any drop in oil pressure below predetermined safe operating levels activates the unit and energizes danger signals or emergency controls. Where gasoline engine-powered installations are involved, an oil pressure drop causes the mechanism to break the ignition circuit, and the gasoline engine stops. Oiltrol Co., 2550 15th St., Denver.

WOODWORKER

Master woodworker features a 10-in. wood lathe, drill press, table saw, disk sander, grinder, wire brush, buffer, and

WHEN TRANSMISSION BELTING SPECIFICATIONS ARE TOO TOUGH TO FIGURE OUT



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He has the formula right on his desk in the big catalog of Thermoid products. By just a few simple steps, based on the specifications of the machine to be serviced, the guess work is taken out of the task of ordering the right transmission belting for any application.

He can tell you how it's built—

In case you should be interested in the weight of the duck and the composition of the live skim between plies. Users of transmission belting take long wear construction for granted when belting carries the Thermoid trade mark.

He knows something about Thermoid too—

Thermoid concentrates its manufacturing for industry on the well integrated line shown below. The Company itself, while large enough to be thoroughly reliable, is still small enough to keep active contact with customers and their problems. That's one of the reasons why—

IT'S GOOD BUSINESS TO DO BUSINESS WITH THERMOID!

* A postcard or a letter to the home office will bring his name and address to you.

Manufacturers of new equipment are invited to correspond direct with the home office.

Thermoid
INDUSTRIAL RUBBER PRODUCTS
BUILT FOR THE JOB
QUALITY · VALUE · SERVICE

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AUTOMOTIVE • INDUSTRIAL
OIL FIELD • TEXTILE

THERMOID COMPANY, TRENTON, N. J., U. S. A.

THE THERMOID LINE INCLUDES: INDUSTRIAL BRAKE LININGS AND FRICTION PRODUCTS • TRANSMISSION BELTING • F.H.P. AND MULTIPLE V-BELTS AND DRIVES • CONVEYOR BELTING • ELEVATOR BELTING • WRAPPED AND MOLDED HOSE.

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

For Conveyor Belts

FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts

ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

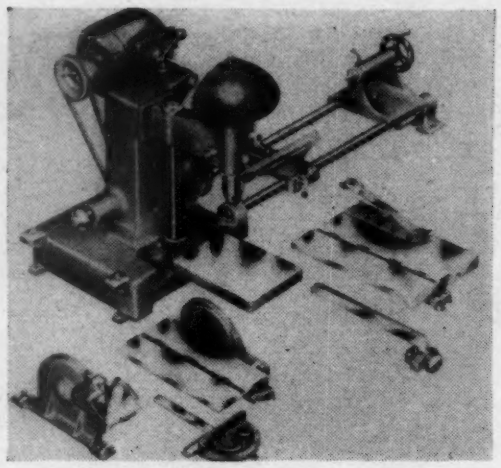
For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅝" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

Sold by Supply Houses Everywhere

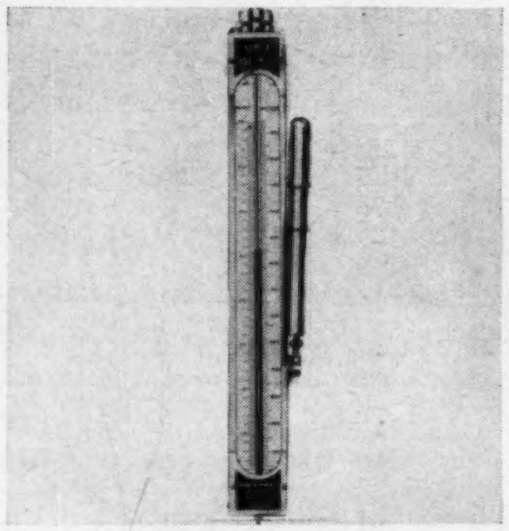
FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.



auxiliary drive run by a single motor which rotates 90 degrees for use with the drill and operates horizontally on the other operations. Pulley assembly provides four speeds, ranging from 775 to 3850 r.p.m. Construction features include close-grained iron normalized castings, alloy steel spindles, New Departure ball bearings, and Timken taper roller bearings. All units have safety guards. An auxiliary drive shaft permits use of a bandsaw, jigsaw, jointer, and other tools. Reypo Corp., 9900 Lincoln Blvd., Los Angeles 45.

LIQUID LEVEL GAGE

Type S Tank-O-Meter measures contents of tanks at any remote point, whether the tanks are open, vented,



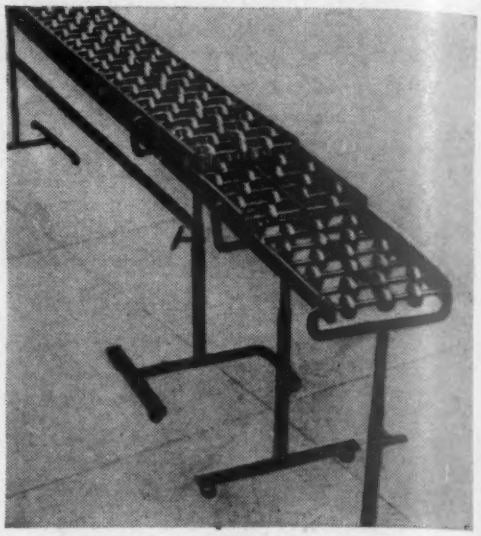
under pressure, or under vacuum. Can be furnished with high or low alarm switches for closing or opening a circuit at any predetermined high or low levels. Line consists of 52 standard models for measuring liquid depths ranging from 1 to 75 feet. Can be obtained for hand pump or compressed air operation. Uehling Instrument Co., 473 Getty Ave., Paterson 3, N. J.

MASONRY WATERPROOFING

One coat of Agraseal is said to waterproof all porous masonry surfaces. A second coat may be applied to obtain stronger color value or a smoother finish. The substance is applied with a scrub brush, and when it sets a positive seal is established which withstands dampness, water, steam, alkali, sun, smoke, heat, cold, frost, and ice, according to the manufacturer. It comes in powder form and mixes with water. One gallon covers 50 square feet for the first coat, and 100 to 150 square feet when second coat is applied. Tamms Silica Co., 228 North LaSalle St., Chicago 1.

TELESCOPIC CONVEYOR

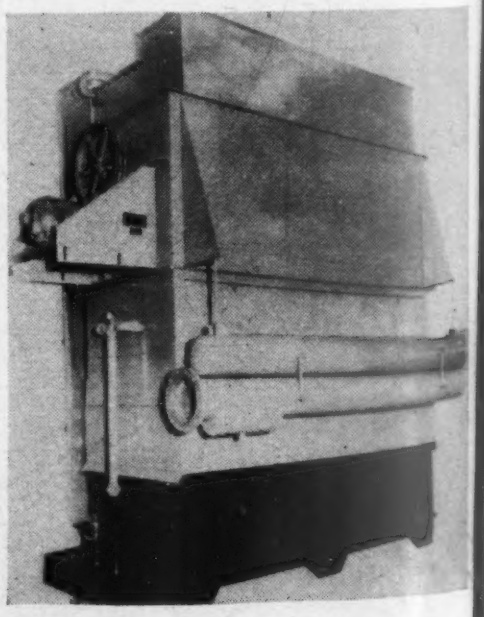
Telescopic gravity conveyor folds up to a 10-ft. length, is easily moved from one operation to another, and adjusted for



height and incline to meet different requirements. Conveying packaged goods on short hauls, the conveyor comes in three sizes—10 to 20, 10 to 30, and 10 to 40 feet—has a frame construction of ½x1½x$\frac{3}{16}$ channel iron, and ball bearing skate wheels. The legs are adjustable; there is only one leg per section. It has 3-in. casters, and a pressure break lock secures the conveyor while in use. The telescopic feature can also be built into existing systems. The Wilkie Co., 5520 Arch St., Philadelphia.

COMPRESSED AIR COOLER

"Aero After Cooler" is the name of a unit for cooling compressed air and condensing and removing the water vapor contained in it. Approximately 1000 B.t.u. per pound of water evaporated are removed from the compressed air. The coils are arranged laterally across the spray chamber, and the compressed air is introduced through an oversized manifold located lengthwise on the outside of the casing. The air is withdrawn

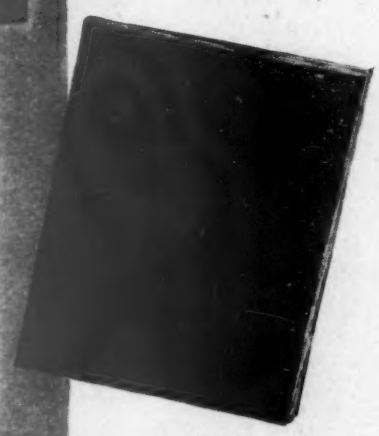


TAKE THE "MUSCLE" OUT OF MOVING
with "THRU-THE-AIR" handling!

It doesn't pay to "sweat" loads here and there—not when push buttons do it for less!

"Thru-the-air" handling, as typified by P&H Trav-Lift Cranes, saves time and money on every move. Without effort, without delay, it moves any kind of load from any point to any other within the area served. And every action of the load—lifting, moving, lowering—is accurately controlled by the operator's thumb!

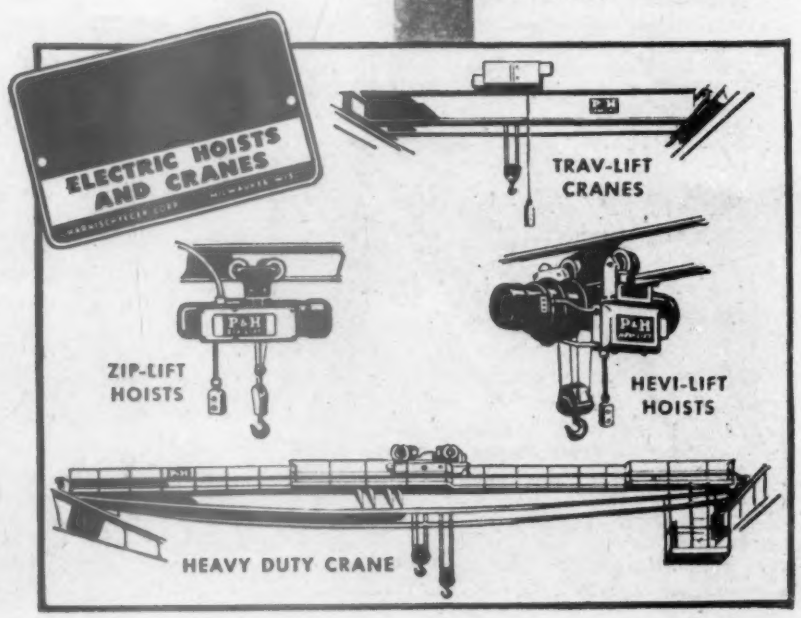
Where handling needs are varied, and service intermittent, there is no surer way to cut costs than with P&H Trav-Lift Cranes. Available with floor or cage control, capacities up to 15 tons. See bulletin at right.



See how others are profiting with P&H Trav-Lifts. Forty pages of application pictures and complete specifications — in your free copy of Bulletin H13-1.

The "Extras" Are STANDARD EQUIPMENT, Added Values on P&H Trav-Lift Cranes

- Shaved gears for lifetime service . . . all bearings grease-sealed.
- Thermal overload protection against motor burn-outs . . . twin brakes for extra safety.
- Motors specifically designed and built by P&H for crane service . . . hoisting, trolley, bridging.
- Effortless push-button control . . . available for all motions and with variable speed feature.
- Transformer provides 110 volts at push-button.
- P&H's true motor ratings assure against failure at full capacity loads and speeds.



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HARNISCHFEGER CORPORATION
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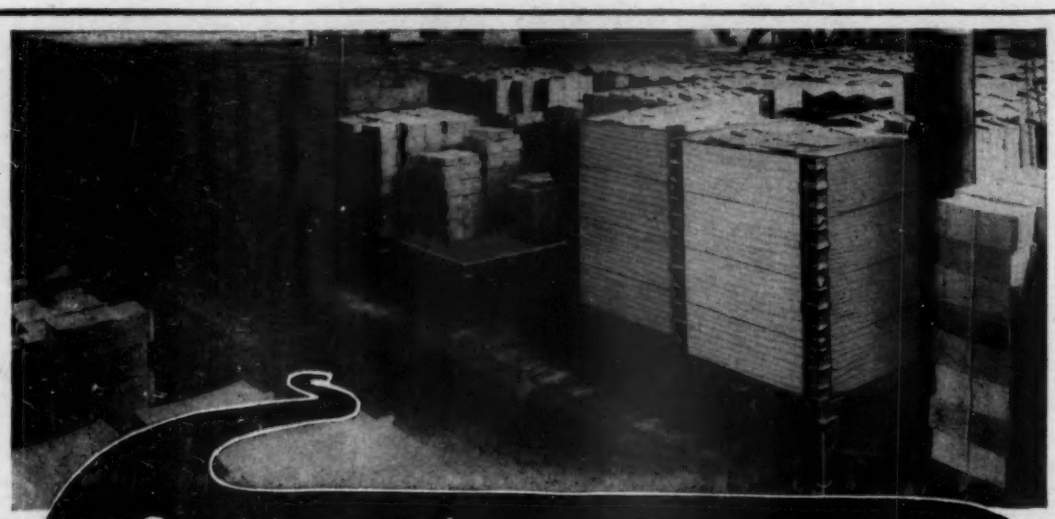
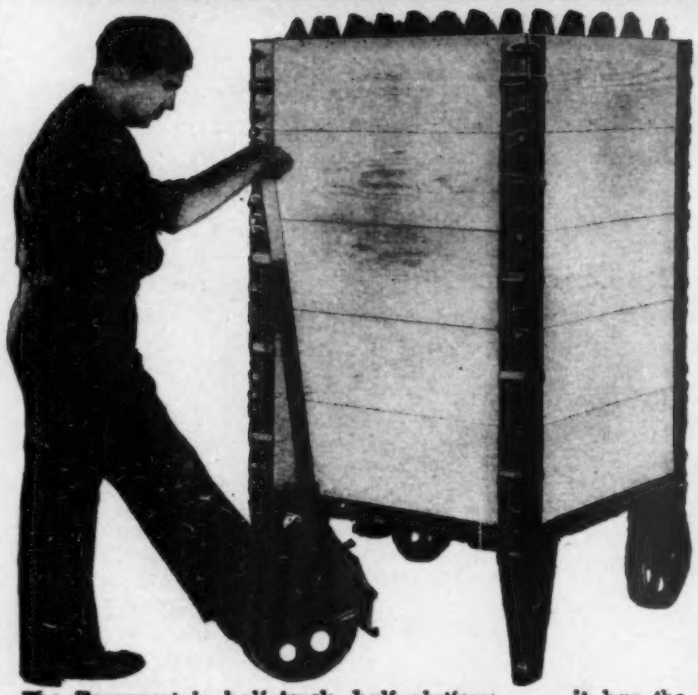


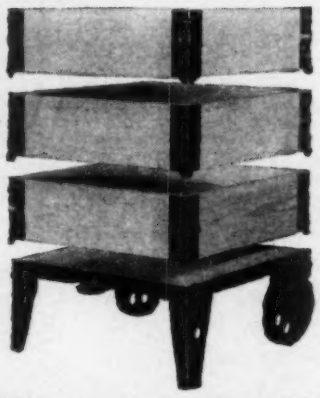
Better than Building!
Save Present Floor Space
with
THE TURNER SYSTEM
OF MATERIALS HANDLING



SAVE
Building Costs
—Increase efficiency

Other firms have saved up to 50% of floor space with the TURNER SYSTEM. Doesn't it make sense, then, to find out what it can do for you —BEFORE you build? In these days when building costs are soaring you may save yourself some real "headaches" by letting the TURNER SYSTEM make the most of what you have. Then, when you DO build, you have the benefit of DOUBLE saving.

The Transport is half truck, half platform . . . it has the advantages of both, the disadvantages of neither. Fitted with Bin Sections (wooden-side or all-steel), Racks, Trays and Die Tables, it is moved by hand "Jimmy," power lift truck, crane or tractor.



Bins are always the right size because Sections (above) are removed as load diminishes, added as load increases. Cuts labor costs in a big way.

Floor Plate Deck Transport is illustrated. Other types have Wooden, Grid and Flat Steel decks.

VERTICAL AND HORIZONTAL EXPANSION SYSTEMATIZES EVERY CUBIC FOOT IN YOUR PLANT

WRITE TODAY FOR:

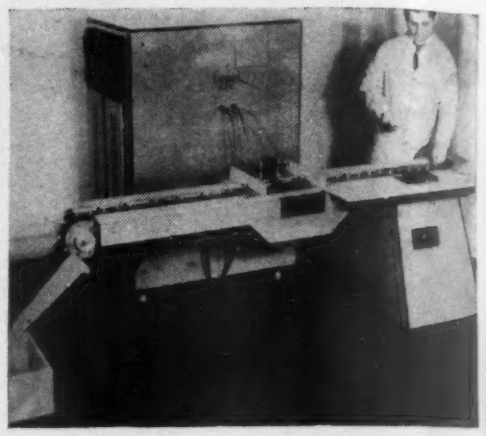
1. **DESCRIPTIVE BOOK ON THE TURNER SYSTEM.**
2. **60 DAY FREE TRIAL OFFER.**

FACTORY SERVICE COMPANY
4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

to the receiver through a similar manifold, which is said to reduce the friction of the compressed air in the coils and secure greater contact with the evaporating spray. Niagara Blower Co., 405 Lexington Ave., New York 17.

CONVEYOR BELT TABLE

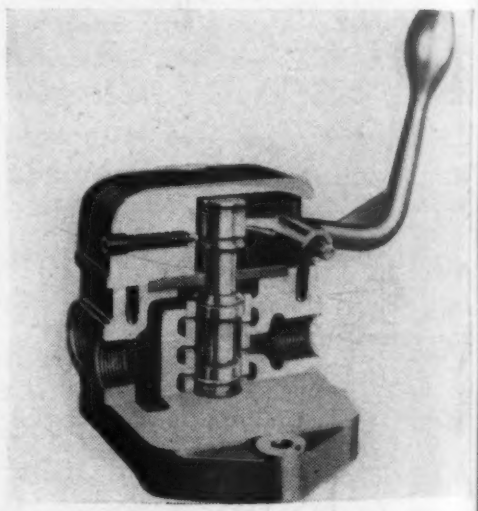
Constructed for use with induction heaters, conveyor belt table handles work parts for brazing, soldering, annealing, and hardening. The conveyor belt is powered by a ¼-hp. motor and



the belt speed may be regulated to accommodate different applications. The belt permits fastening interchangeable supports to hold work parts of various shapes in place. Load coil is movable. Lepel High Frequency Labs., Inc., 39 West 60th St., New York 23.

AIR CONTROL VALVES

Redesigned line consisting of 79 models of air control valves features sliding piston-type construction which eliminates valve seats and rod packing. The 4-way valves are offered in a range of control types. Foot and manifold mount-



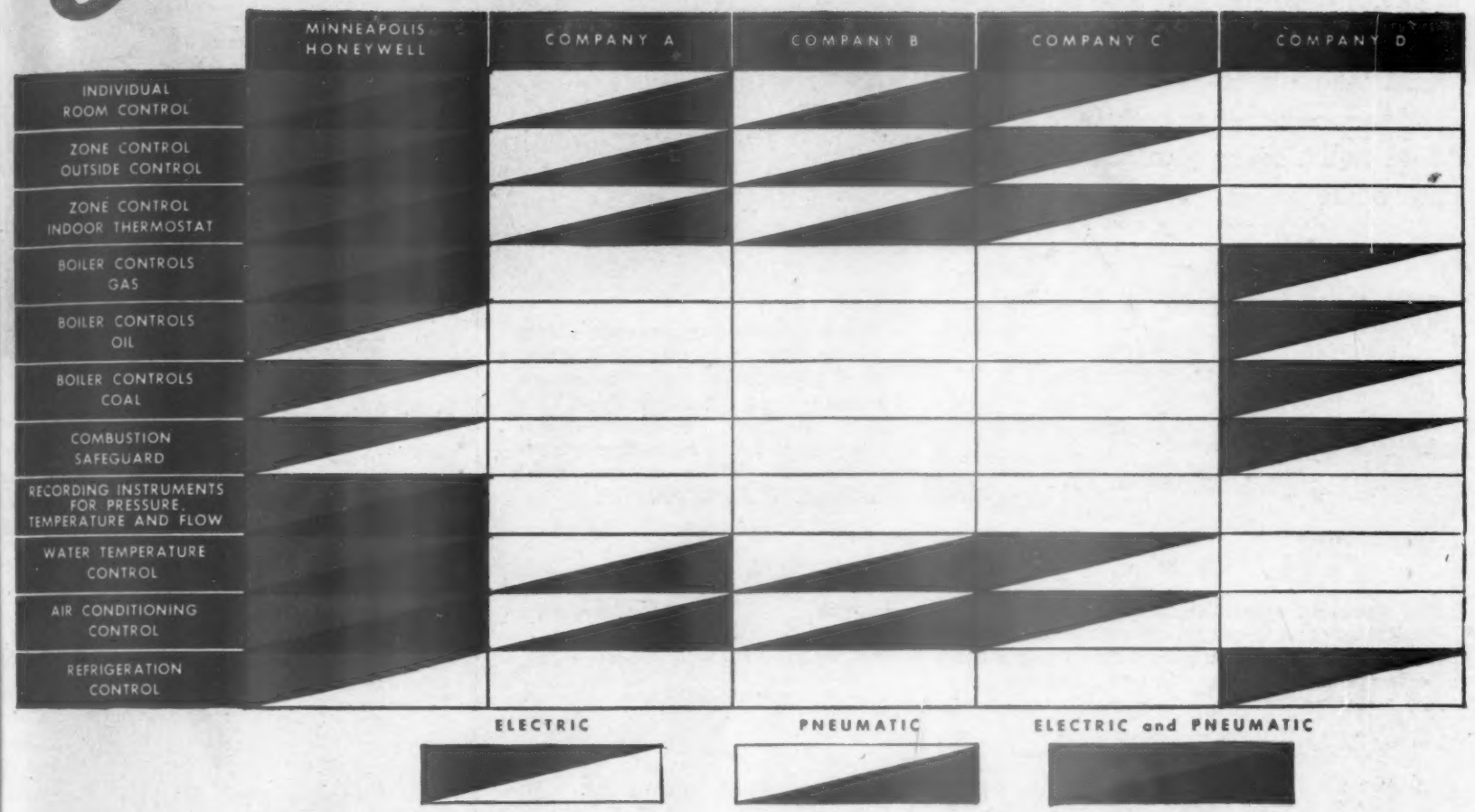
ings are available in the manual, cam, and electric operated valves. Manual valves are also made with a flange mounting. The valves are built for operation at pressures to 150 p.s.i. Logansport Machine Co., Inc., 905 Center Ave., Logansport, Ind.

BATTERY TERMINAL PULLER

Corroded battery cables can be removed from the battery terminal with a positive-acting puller now on the market. The jaws of the puller are

ONLY HONEYWELL gives you

Controls for Every Purpose!



THE chart tells the story! Only Minneapolis-Honeywell can supply a complete line of both electric and pneumatic controls for every factory requirement. Think what this means from your standpoint. All your controls from one manufacturer means uniformity of design and quality . . . and standardization means efficiency. It's the same manufacturer —Minneapolis-Honeywell—who is able to give you unbiased advice, based on broad engineering experience, about every type of control. And Honeywell maintains a nation-wide staff trained to provide service from plan stage throughout the life of every installation, electric or pneumatic.

Backing this comprehensive operation is the Honeywell reputation for dependable performance, established for over 60 years. Benefit by standardizing with Honeywell—the leader . . . Minneapolis-Honeywell, Minneapolis 8, Minnesota . . . In Canada: Toronto 12, Ontario.

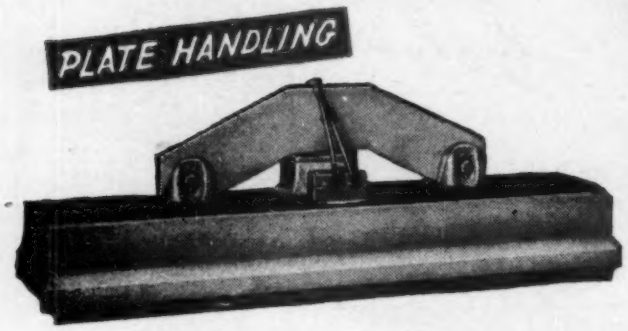
MINNEAPOLIS **Honeywell**
CONTROL SYSTEMS

ECM Magnets give a LIFT wherever needed—

in size and type for every need

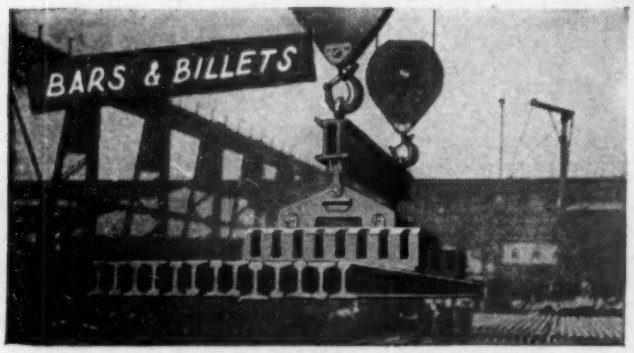
For odd jobs, specific jobs, and heavy, continuous duty applications — for your every requirement—we offer you the right size and type of magnet. Throughout nearly 50 years, we have built magnets to improve operations and reduce handling costs in foundries, steel mills, scrap yards, warehouses, and other places.

For heavy duty service such as handling scrap, pig iron, and nail kegs on a tonnage basis—Type SW All-Welded Circular Magnets. Streamlined design—high lifting capacity—watertight coil within a watertight housing. Bulletin 900.



For specific applications—used singly, in duplicate, or in triplicate on a spreader beam for long plates or other materials—Types P & F Rectangular Magnets. Sturdy, dependable, low maintenance. Bulletin 903.

For reaching into corners of plants and railroad cars, between machines and through narrow aisles—Type R Circular Magnets can be mounted on crane trucks making mobile units. Supplied in five sizes. The 29-inch diameter magnet, shown, receives 36-volt power directly from the truck. Sizes are available for all types and makes of crane trucks. Bulletin 904.



For hot or cold billet and rail handling—Type BR Magnets with circular-wound coils assuring great strength and high magnetic efficiency, also free circulation of air around coils. Bulletin 901.

Use the following coupon in sending for helpful literature on magnets suited to your needs.

THE ELECTRIC CONTROLLER & MFG. CO.,
2690 East 79th Street **Cleveland 4, Ohio**

Please send me Bulletin ☐ 900 ☐ 901 ☐ 903 ☐ 904

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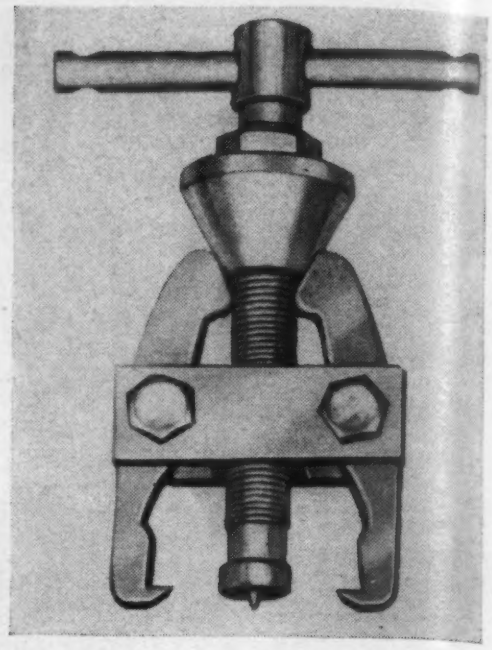


forced under the cable connections, or into them if necessary, by hexagon adjusting nut over the cone. When a secure grip is obtained the pulling action is effected by turning the "T" handle. Owantonna Tool Co., 363 Cedar St., Owatonna. Minn.

WATER COOLER

Self-contained Model PB-10 water cooler has heavy-gage sheet steel cabinet mounted on a welded steel frame. Front cabinet panel as well as side panels are removable. Top and drain assembly, con-

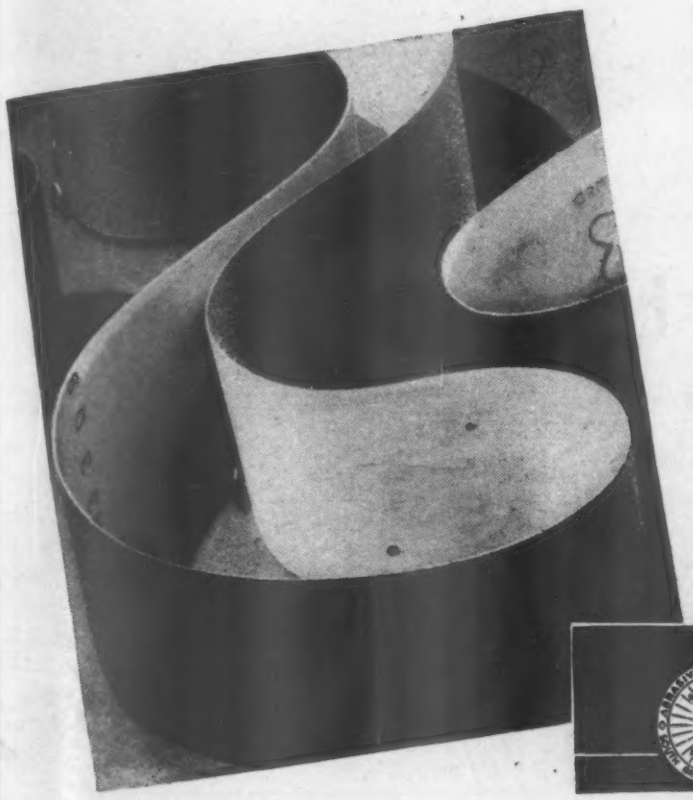
structed of 18-8 stainless steel, incorporate an anti-splash guard which is integral with the top. Corners are rounded. Cooler and storage tank are stainless steel welded at seams. Bubbler provides maximum sanitary protection, and regulator automatically maintains a constant stream of water. Temperature of drinking water is controlled by an adjustable thermostat. Temprite Products Corp., 47 Piquette Ave., Detroit 2.

HAND TRUCK

Built to facilitate the handling of cases, cans, and boxes, the Hi-Boy utility hand truck can be loaded up to the top. Made of 1-in. steel tubing, it is welded throughout, and is equipped with either plain bearing or roller bearing solid rubber cushion tread wheels. Plain bearing wheels have self-lubricating bushings. Wheels are 6 inches in diameter,

"SILVER STREAK BELTS . . . Sure, got that size in stock"

PHONE YOUR JOBBER TODAY, and ask for Silver Streak Belts, the *insulated* abrasive for high speed finish grinding. You'll be surprised how fast you get delivery. It's prompt shipment on *all* sizes, from stock on many.



And this also applies to Jewelox Aluminum Oxide Belts, for grinding and polishing hard metals. Jewelox is the hardest, toughest abrasive in commercial use—eminently adapted for use under the most severe conditions.

Both Silver Streak and Jewelox Belts have the exclusive Velvet Joint, one of the greatest improvements in abrasive belt making. Velvet Joint Belts lie smooth, do not jump or bump, last longer.

Order a supply now from your jobber. Remember, there's a standard or special type and grade of Jewel Abrasive Belt for every requirement. If your jobber hasn't heard this prompt-shipment news yet, write to Abrasive Products, Inc., 519 Pearl Street, South Braintree, Mass.

• **JEWELOX,** the hardest, toughest abrasive in commercial use. Lasts longer on the hardest metals.

• **SILVER STREAK,** the heat-resistant abrasive that lets you speed up production safely.

Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS · MAKERS OF JEWEL COATED ABRASIVES

Automatic
MOTOR-GENERATOR CHARGING
with the
HERTNER
TYPE "H" SINGLE CIRCUIT
BATTERY CHARGER

Means longer life for your motorized Lift-Truck Batteries.

Hertner Motor-Generator sets operate at the quiet, long-life speed of 1750 r.p.m.

Completely-Automatic Controls Prevent Current Losses Avoid Over-Charges

Economical operation of your motorized lift-trucks depends largely upon low-cost, dependable charging of the batteries—charging that will extend their "life expectancy." With Hertner Type "H" single chargers, there are no current losses through charging resistors. These chargers operate at 1750 r.p.m. and have long life with trouble-free performance.

The charging rate is automatically and positively controlled and the charger automatically shuts off when the battery reaches full charge. Pilot light indicates that charger is operating.

Mail coupon for Bulletin 101 describing Model "H" single-circuit chargers, or Bulletin 102 describing Model "H" multiple-battery chargers.

The* HERTNER *Electric Co.

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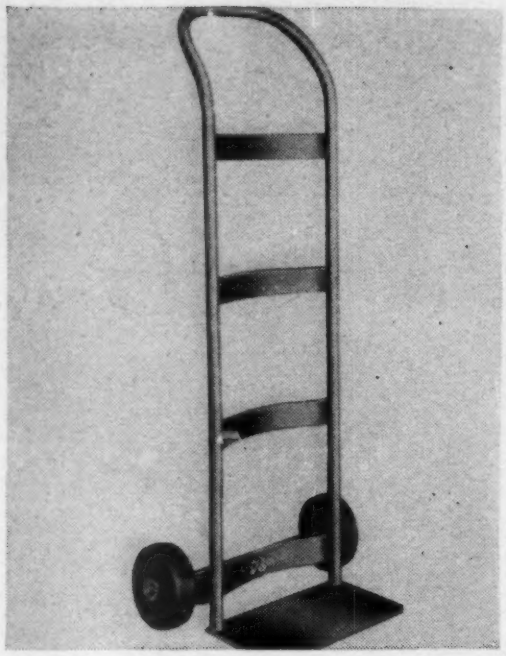
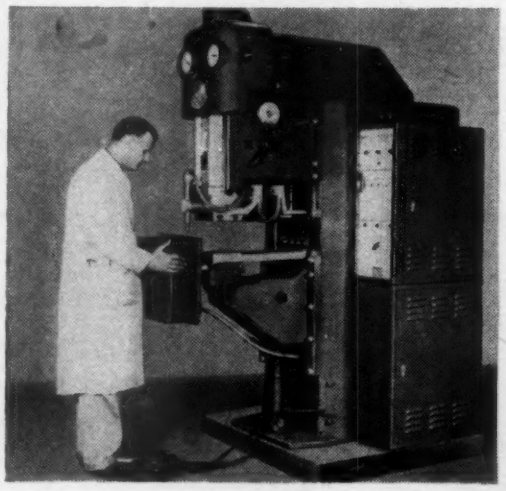


and have 2-in. treads. Nose of truck is 14 inches wide, 7 inches deep. Over-all length is 48 inches, and truck weighs 30 pounds. Bond Foundry & Machine Co., Manheim, Pa.

WELDING CONTROL

Synchronous, a.c. resistance welding controls are offered in a factory-assembled package called Synchro-Trol. Eight assembled sub-units and five supplementary sub-units are designed to provide hundreds of combinations for timing and sequencing. The control unit may be side-of-welder or floor mounted.



Each job is set by fingertip control, and transparent access door protects control setting. Inspection is facilitated through a front access door, and swing-out feature of cabinet provides access to rear. Sub-units are pulled-out type and may be removed for changes in control requirements. Westinghouse Electric Corp. P. O. Box 868, Pittsburgh 30.

PAINT SPRAYGUN

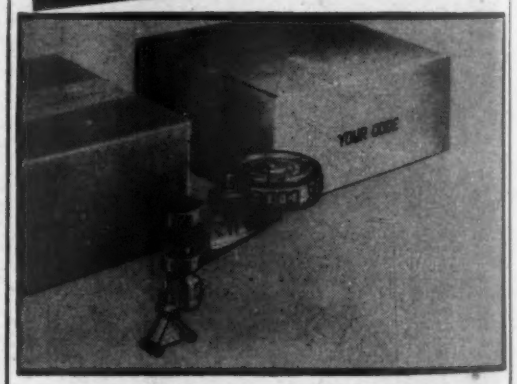
Pressure feed "bleeder" spraygun can be used as an internal or external mix gun. The external nozzle accessory is known as the CKD conversion kit. The conversion is said to permit speedy spraying of fast drying materials with less cleaning of nozzle parts, and the kit makes it unnecessary to change nozzles for varying the spray patterns. A turn on a self-locking adjusting ring provides

Do you have a LABOR-MANAGEMENT *Missing Link?*

The chain of cooperation between employees and employers needs all the strong links it can get. Many industrial plants have found one such strong link in Robbins Service Awards. To workers who have a long record of loyal, steady employment, a Robbins Service Award signifies management's esteem and gratitude. To fellow-employees, this public display of the bond between labor and management has an invaluable morale-building effect. Write for particulars about Robbins Service Awards.

The Robbins Company
Ideas in Metal
ATTLEBORO, MASS.

MARKS CASES *in Motion* AUTOMATICALLY!



NEW IMPROVED ROLACODER IMPRINTS CARTONS OR DRUMS MOVING ON CONVEYOR LINE

- Eliminate time and labor costs from case-marking operations! ROLACODER makes clean, sharp imprint of code-dates, lot numbers, content information on cases, crates, cartons, kegs, drums . . . without slowing travel on conveyor. Imprint may contain up to five lines of type.
- ROLACODER is friction-operated . . . requires no outside power source. May be installed quickly, easily on conveyor, packaging or sealing machine. Uses interchangeable type.
- Write today for full details, and state your *specific* marking requirements.

ADOLPH GOTTSCHO, INC.
189 Duane St. New York 13, N. Y.

Get a Head Start with

JESSOP *Standard*

"MALTA" CARBIDE TOOL TIPS

JESSOP'S Standard Malta Carbide Tool Tips will enable you economically to take care of many of your carbide tool requirements in your own shop. Simply mill or grind recess in your tool shank, braze in the MALTA tip, grind, and you are off to a head start for increased production.

Remember, too, that JESSOP standard Malta Carbide Tool Tips will produce more parts per hour and give longer life between grinds, as well as an improved finish to the part. Six standard grades are available—three for general purpose and three for special purpose work—to take care of the majority of your machining operations.

Write today for the JESSOP catalogue on "MALTA" Carbide tool tips, tools, dies, and wear resisting parts.

JESSOP STEEL COMPANY • SPECIALTY STEELS •

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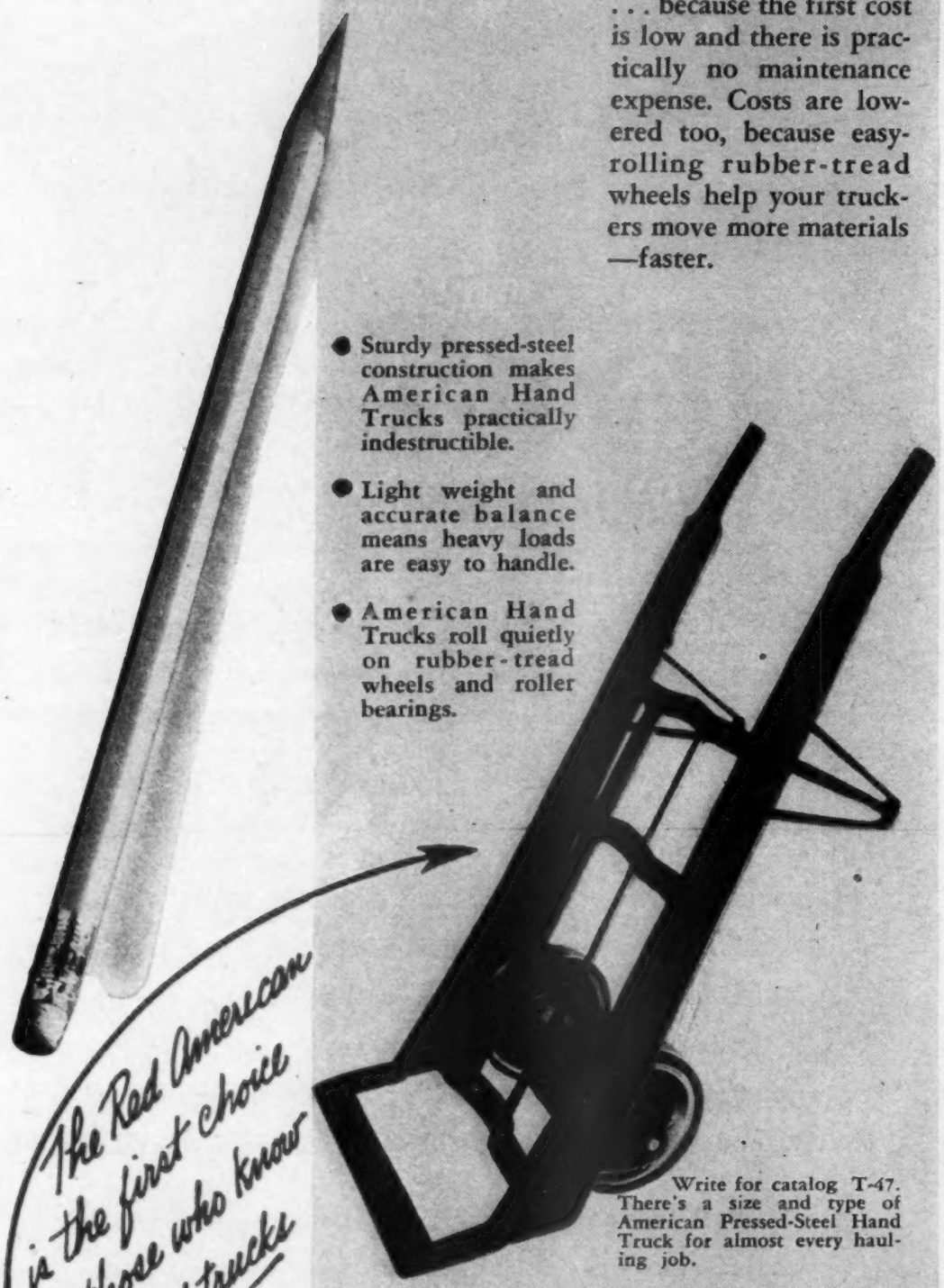
WASHINGTON, PENNSYLVANIA

Tailor-made Specialty Steels

How to Figure on Reducing Hand Truck Operating Costs

AMERICAN PRESSED-STEEL HAND TRUCKS SAVE YOU MONEY . . . .

. . . because the first cost is low and there is practically no maintenance expense. Costs are lowered too, because easy-rolling rubber-tread wheels help your truckers move more materials —faster.



- Sturdy pressed-steel construction makes American Hand Trucks practically indestructible.
- Light weight and accurate balance means heavy loads are easy to handle.
- American Hand Trucks roll quietly on rubber-tread wheels and roller bearings.

The Red American is the first choice of those who know hand trucks

Write for catalog T-47. There's a size and type of American Pressed-Steel Hand Truck for almost every hauling job.

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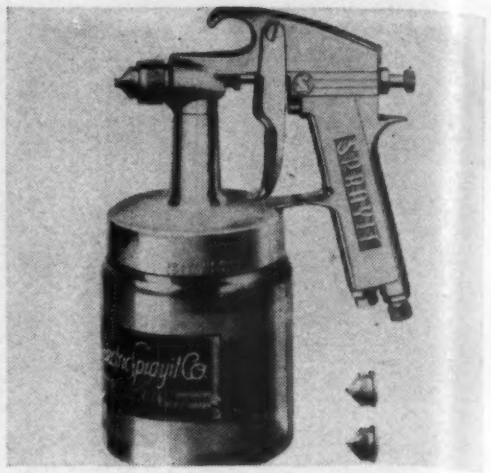
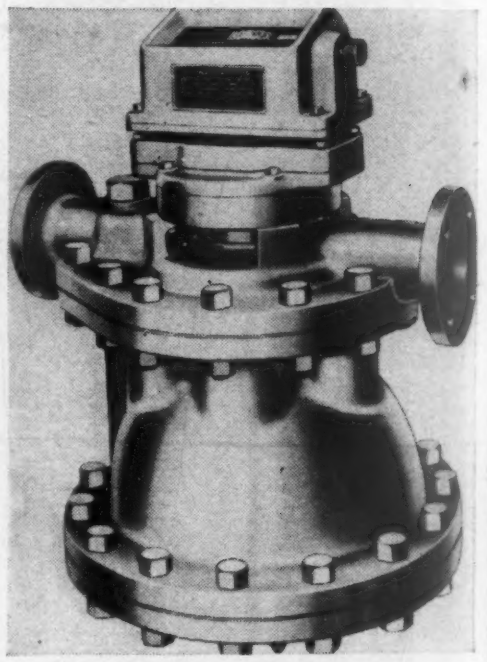
PRESSED-STEEL
HAND TRUCKS



a range of patterns from small round to wide fan, without stopping the gun. Oil and moisture filter built in handle prevents contamination of the spraying material. The Electric Sprayit Co., Sheboygan, Wis.

VOLUMETRIC METER

Claimed to provide accurate volumetric displacement measurement 1½-in., 50-g.p.m. meter is constructed of stainless steel, with internal chemically resistant parts made to reduce friction. Vertical piston operation minimizes cylinder and

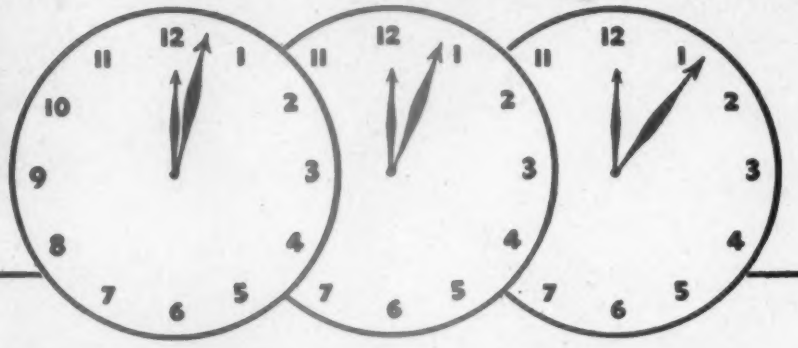


piston wear. There are few working parts. Direction of flow keeps any suspended material flowing evenly through the meter. Maximum working pressure is 250 p.s.i. Bowser, Inc., Fort Wayne 2, Ind.

HAMMERS

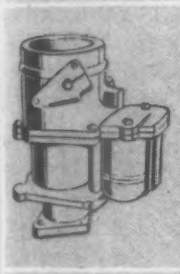
Nupla hammers feature replaceable tips stamped "soft," "medium," and "hard," according to grade, for quick selection. Two tips of different grades may be kept on the hammer at the same time, while a third may be substituted by unscrewing the tip not needed. While in use they are locked in place. The hammer has virtually no rebound or sting, and the tips are made of "live" material called Nuplaflex which retains its shape under severe punishment, maker says, and are chip-proof, non-explosive, and will not flash burn. Non-spark sleeves are made

How to Cut Metal Cleaning Time to MINUTES

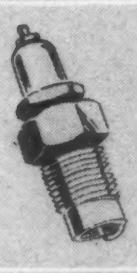


NEW, FAST-ACTION DETERGENT CLEANS FERROUS AND NON-FERROUS METALS... Easy to Handle

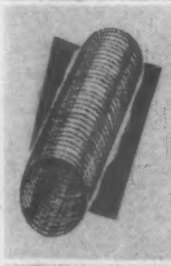
TYPICAL USES FOR Solvent "26"



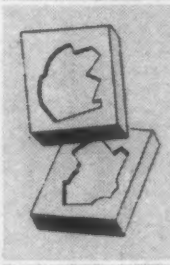
CARBURETORS—Solvent "26" removes gum, gasolene sediment and other accumulations of dirt.



SPARK PLUGS—Solvent "26" safely cleans porcelain; helps loosen carbon deposits.

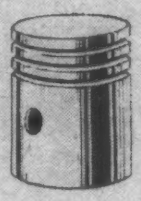


METAL PLATES AND SCREENS—Solvent "26" restores clear, clean finish to any metal surface.



DIES AND STAMPING—Solvent "26" removes drawing compounds from die-formed or stamped metal.

LABORATORY EQUIPMENT—Solvent "26" frees glass and metal tubing and their supports of gums, varnishes and other incrustations or deposits.



PISTONS—Removes lacquers, gums, resins, etc. from gas, gasolene and diesel engine pistons and rings. Also effective for cleaning all parts of dismantled motors, engines and machinery.

REMOVES:

Oil • Grease • Gums • Varnishes • Lacquers • Paints
Carbonaceous Deposits • Asphaltic Products

FROM:

Steel • Cast Iron • Aluminum • Porcelain • China
Chrome and Nickel Plate • Stone • Precious Metals
Brass • Washable Fabrics

Used throughout the war in critical industry as a superior cleaning agent, newly-developed SOLVENT "26" is now available for all industrial needs.

Offering many advantages in time, labor and cost over other present cleaning methods . . . Solvent "26" is so effective a detergent it can be used at *ordinary* room temperatures.

The fast action of Solvent "26" reduces cleaning time from hours to minutes on dismantled engine parts and all kinds of machinery. Simply dip, rub, brush or spray it on. Then flush clean with hot water.

Mail the coupon today for literature and information leading to a demonstration of this unique product in your own plant.

CITIES SERVICE

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CITIES SERVICE OIL COMPANY
SIXTY WALL TOWER, NEW YORK 5, N. Y., ROOM 106

Please contact me for a demonstration of Solvent 26.

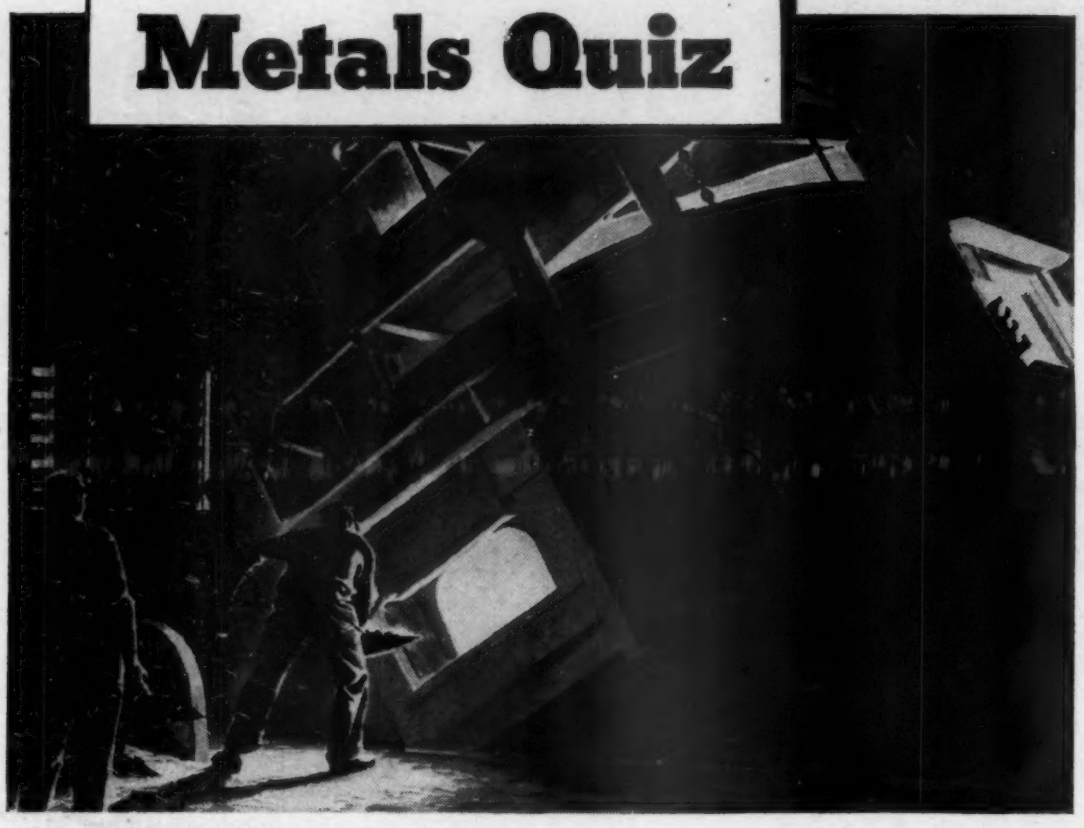
NAME.....

TITLE.....

ADDRESS.....

CITY..... STATE.....

Metals Quiz

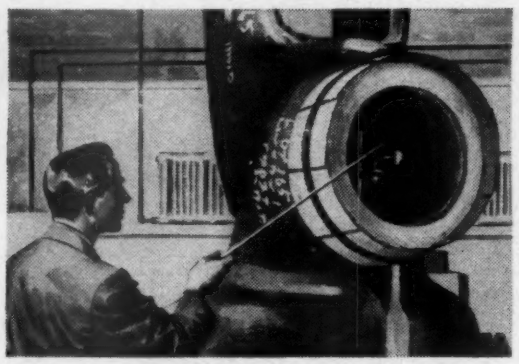


What makes stainless steel stainless?

Chromium and nickel. These steelworkers are shoveling chromium into a furnace to make the finished steel rust resistant. Sheet stainless steel is frequently covered with extra-wide Permacel paper tape to prevent scratches in shipment. This Permacel is often left on while stainless steel products are made, so that you will receive perfect, unmarred products.

What's this "tin-foil" wrapper made of?

Aluminum. It has replaced tin because it's cheaper, exists in large deposits in the U. S., and can be rolled to one or two ten-thousandths of an inch. Permacel acetate fiber tape is often used to mend firmly any breaks which occur while aluminum foil is being rolled.



How are casting flaws located?

With radium. It "sees" through thick metal, registering tiny imperfections on sensitized film. This technician is putting a radium sulfate capsule in place for photographing. The film is held securely around this three-inch section of an engine part with Permacel cloth tape.

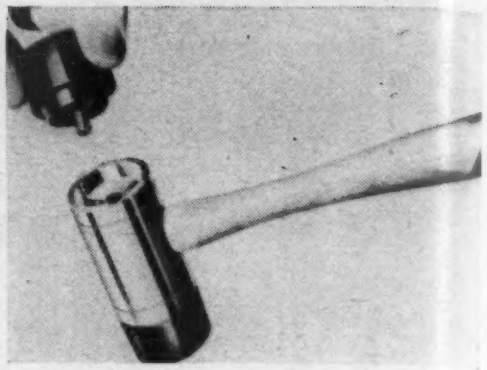
What are some other uses of tape in the metals field?

Permacel Industrial Tapes, including heat-sealing and pressure-sensitive tapes, speed production and cut costs by masking, stenciling, sealing, identifying, protecting, insulating, packaging, reinforcing. Write for free booklet, "Fact Book on Pressure-Sensitive Adhesive Tapes." It shows how to use Permacel Industrial Tapes in your plant. Dept. **FM-11**, Industrial Tape Corp., New Brunswick, N. J.

Permacel INDUSTRIAL TAPES

INDUSTRIAL TAPE CORPORATION • NEW BRUNSWICK, N. J.

"PERMACEL" REG. U. S. PAT. OFF.



of aluminum alloy, and handles are seasoned hickory. The hammer may be obtained in five sizes and ten weights. New Plastic Corp., 1017 North Sycamore Ave., Los Angeles 38.

GAS ALARM SYSTEM

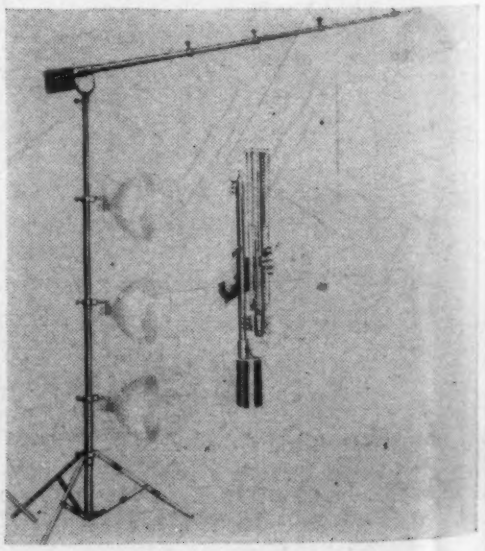
Developed to detect combustible gas concentration, multipoint gas alarm system is available for sampling from 6 to 12 locations. All remotely located analyzing heads are controlled from a single cabinet occupying a floor area 22x17¼ inches. Panels are placed one above the other instead of side by side. Meter, motor, main switch, alarm relays, and pushbutton controls are mounted on the top panel, and the other seven panels are connected to individual analyzing heads. Pump is mounted in the base. The system may be connected to relays actuating CO_2 or fog fire blanketing systems. Davis Emergency Equipment Co., Inc., 111 Halleck St., Newark 4, N. J.

NON-SLIP FLOOR WAX

Slip-resistant Vesta-Gloss S.R. is a free-flowing floor wax with self-leveling properties, and is said to dry to a high luster without polishing. Can be used on any floor, regardless of color or type. Vestal Inc., 4963 Manchester Ave., St. Louis 10.

PORTABLE LIGHTING BOOM

On-the-spot floodlight can be provided under a truck, inside a boiler, above a lathe, and other jobs by industrial lighting boom and standard. The boom swings to any desired length and position in a vertical radius of 170 degrees, reaching



MOBILIFT *Presents*

A NEW 3000 POUND MODEL!

- ★ 3000-lb. Capacity
- ★ Rugged Construction
- ★ Compact Size
- ★ 20 Horsepower Motor
- ★ No Gear Shift
- ★ Weight 4450 lbs.
- ★ Controlled from Standing Position

MODEL K
Capacity 3000 pounds

HERE IS MODEL K, another Mobilift cost cutter with greater power and greater capacity. This new model is the result of years of field research and skilled engineering. In appearance and operation it conforms with our 2000-pound Mobilift Model F. Only slightly larger and heavier, it gives you greater capacity combined with the same speed, maneuverability, and ease of operation which has made Mobilift the leader in the light truck field. Investigate this rugged 3000-pound Mobilift. Get in touch with one of our factory branch executives — or write direct for complete details today!

FACTORY BRANCHES:

34-48 Steinway St., Long Island, N.Y.
2430 South Parkway, Chicago 16, Ill.
107 Walton Street N. W., Atlanta, Ga.

HOW'S YOUR INGENUITY ?

Hein-Werner

HYDRAULIC JACKS

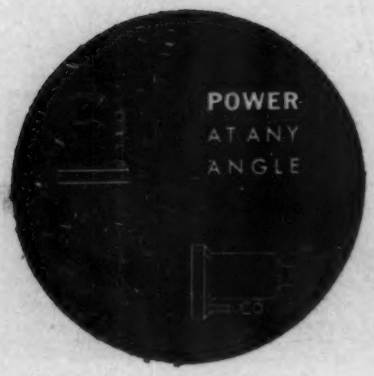
have many industrial applications

They're Great for:

- **CLOSING PRESSES**
- **BENDING RODS**
- **LIFTING HEAVY LOADS**
- **PUSHING OR PULLING**
- **PRESSING BUSHINGS**
- **MOVING MACHINERY**

Hein-Werner Hydraulic Jacks can be put to many uses in most industrial plants. For example, illustration at top left shows a H-W Jack being used to close a filter press. At right a jack is converted into a big wheel puller. How about YOUR factory?

Complete line includes models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity . . . For details, consult your nearest industrial supply dealer, or write us.



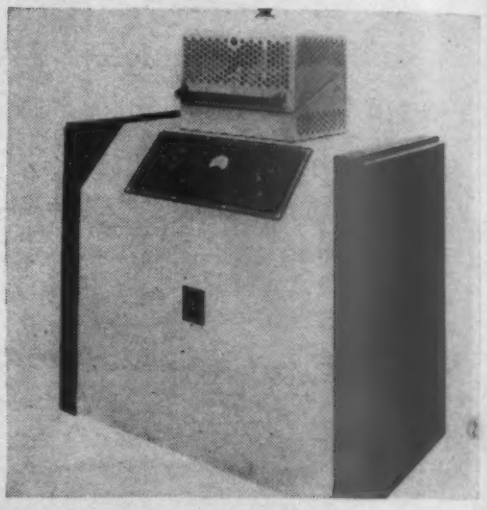
Hein-Werner
HYDRAULIC JACKS

HEIN-WERNER CORPORATION
WAUKESHA • WISCONSIN

from floor level to 14 feet, and has a horizontal radius of 360 degrees over a circle 12 feet in diameter. The Sampson Sr. weighs 10 pounds and folds down to 27 inches; the Sampson Jr. weighs 6 pounds, folds to 23 inches, reaches 12 feet, and covers a 10-ft. radius. Both are suitable for toolcrib storage and handling. Moulin-Lindsay Co., 621 South Lebanon St., Los Angeles.

DIELECTRIC HEATING GENERATOR

A 2-kw. R.F. generator, the Dual Timer 40.9 Mc set, features a cubicle providing two sets of operating controls to permit alternate operations on two different time cycles. Two adjustable automatic timing relays built in control panel



provide alternate power-on periods of from 0 to 165 seconds each. Separate start-and-stop pushbuttons and "load on" indicator lights are provided. The input current meter and filament indicator are in the control panel center. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30.

INSECTICIDE SPRAYER

Vapomat is an automatic electric insecticide sprayer. One filling of Vaposector Fluid, a concentrated insecticide, is claimed to "achieve a positive kill" of flying insects in areas of 500,000 cubic feet. The sprayer is housed in a hammered aluminum case, reducing weight to 8 pounds. An automatic shut-

Productive Power

Up-to-date production machinery cannot be utilized fully with an obsolete power distribution system. Efficient methods of manufacturing demand modern electrical power supply and control.

Thus, getting *maximum* Productive Power from your plant electrical system is of vital concern to every key production man—as well as those directly in charge of electrical installations and maintenance.

On the next two pages you will find specific ways to make *electrical power more productive* —one or more of which can be put to profitable use in your plant.

FOR ANSWERS TO QUESTIONS LIKE THESE—TURN THE PAGE

1. What is the most flexible and economical distribution system to meet changing production requirements?
2. How is a large steel plant saving $1,500.00 per month in power costs?
3. How are automatic circuit breakers saving $2,000.00 per year in outage costs?
4. How can control centers improve continuous processing operations?
5. What type of power conversion has cut maintenance costs as much as 66%?

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Proved ways to Make Electrical

TO SPEED PRODUCTION CHANGEOVERS . .

PRODUCTIVE POWER

Check these typical examples of the ways improved power distribution and utilization can boost plant efficiency. They are equally adaptable whether you are planning a new plant or modernizing existing facilities.

These are but a few of the time-saving, cost-cutting applications possible with the complete line of Westinghouse plant electrical equipment. Skilled Westinghouse engineers, with a practical knowledge of production techniques in *your* industry, are ready to help you on specific problems. For engineering help, just phone or write your nearest Westinghouse office.

WESTINGHOUSE

Power More Productive

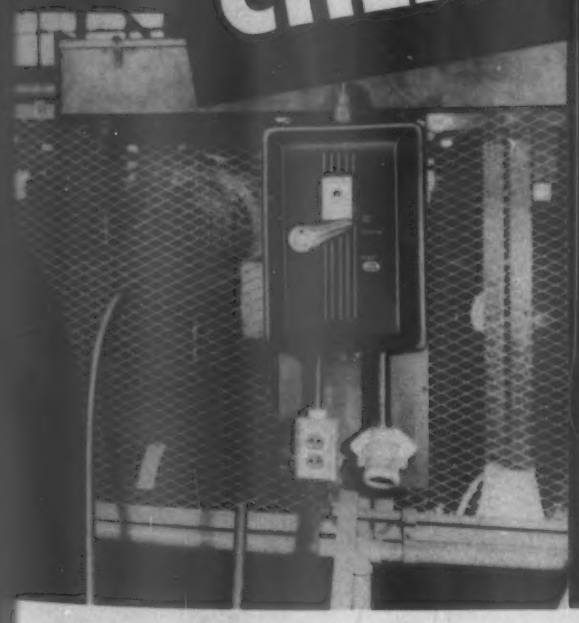
CUT POWER COSTS...REDUCE MAINTENANCE

BETTER...

Control Centers improve operation, increase safety, cut service time . . . . . . In a large mixing room—where 85 motors drive synchronized conveyers, sand mixers and slingers—a Westinghouse Control Center replaced individual starters. Result: centralized, interlocked control of all operations; greater safety for personnel; important savings in service time on individual operations located 200 ft. or more apart.

Ignitron Rectifiers can operate automatically and unattended. With no major moving parts to require maintenance, the Ignitron delivers power continuously, 24 hours a day. Maintenance costs can be reduced as much as 66% by use of Ignitron Rectifiers in place of standard motor-generator sets.

CHEAPER...

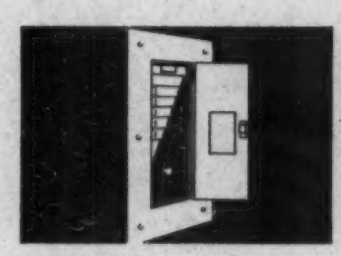


Westinghouse

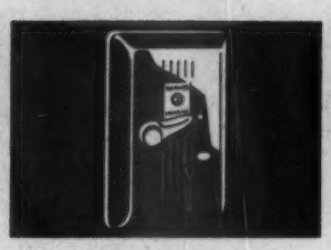
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Here's the complete line of Westinghouse power distribution equipment →

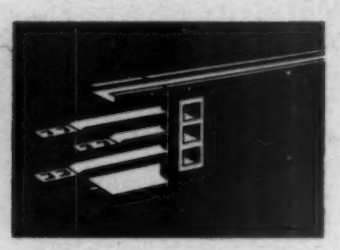
THE RIGHT EQUIPMENT..APPLICATION HELP



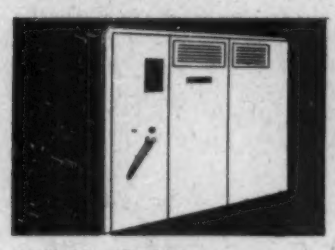
CONVERTIBLE AB "DE-ION" DISTRIBUTION PANELBOARDS are available for circuits from 15 to 600 amperes, inclusive; 600 volts a-c, 250 volts d-c.



AB-I BREAKERS are built in ratings from 15 to 600 amperes at 125 to 250 volts, d-c; 115 to 600 volts a-c. Individually calibrated at factory. Sealed to prevent tampering.

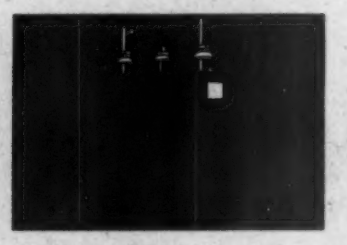


PLUG-IN BUS DUCT ranges in capacity from 225 to 1000 amperes, for 2, 3 and 4-conductor applications. Built in 10' lengths, with plug-in openings at 12" intervals.

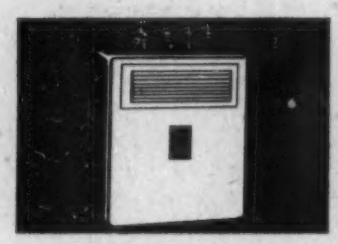


POWER CENTERS are available for voltages up to 15,000, 3-phase, 60-cycle, with capacities of 100 to 2,000 kva, depending upon the voltage.

CONTROL CENTERS to handle combinations of: squirrel-cage motors from 1 to 100 hp, three-phase, 220 to 550 v.; unit starters from NEMA sizes 1 through 4.

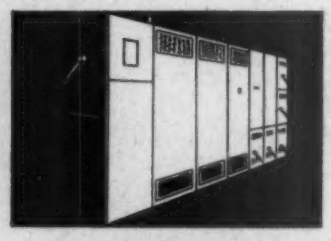


CAPACITORS for indoor mounting are built with single or multiple dust-tight covers; small or large racks; 7½ kva, 230 volts to 2520 kva, 13.8 kv.



ASL AIR-COOLED TRANSFORMERS are built in single and three-phase designs, rated from 150 to 500 kva, 2400 to 15,000 volts.

SAFETY SWITCHES are built in a wide range of models for ratings of 120, 240 and 575 volts a-c; 125, 250 and 600 volts d-c; 30 to 1200 amperes.



AIR-COOLED NETWORK SYSTEM UNITS—capacities of 300, 500, 750 and 1000 kva for high voltages from 2300 to 13,800 and low voltages of 125/216 (4-wire).

APPLICATION ENGINEERING

The how-to-do-it ability of Westinghouse engineers is available at any time to help solve power problems in your plant. This application engineering service applies the broad electrical and production experience gained in many fields of industry to your specific problems. Just contact your nearby Westinghouse office, and a competent engineer will call.

RESEARCH

The scope of Westinghouse research reaches into every industry. Wherever power is used and distributed, this research has played an important role in doing jobs better, faster, cheaper. Westinghouse research facilities are available at any time to help you use new production tools and apply scientific knowledge in finding practical solutions to production problems.

TRAINING MATERIAL

Westinghouse training material includes not only instruction courses in such subjects as electronics and resistance welding, but everyday help in all phases of the operation and maintenance of modern electrical equipment. This help is available in the form of printed literature and training films. Ask your nearest Westinghouse office to show you samples of this material.

MAINTENANCE

A nationwide chain of 34 Westinghouse Manufacturing and Repair Plants offers speedy, effective help on all types of electrical service and repair. A skilled corps of specialists, on call through your nearby Westinghouse office, is ready to help you at any time.

RENEWAL PARTS

Parts warehouses in 29 cities carry complete stocks of genuine Westinghouse renewal parts. Westinghouse distributors—in addition to their own stocks—can secure parts promptly from warehouse or factory stocks.

Mail coupon for more information

Westinghouse Electric Corporation
P. O. Box 868, Pittsburgh 30, Pa.

Please send me more information on the following products:

____Panelboards	____Power Centers	____ASL Transformers
____AB-I Breakers	____Control Centers	____Safety Switches
____Bus Duct	____Capacitors	____Network Units
____Lighting		____Ignitron Rectifiers

Name_____ Company_____

Title_____

Address_____ City_____ State_____

J-90570

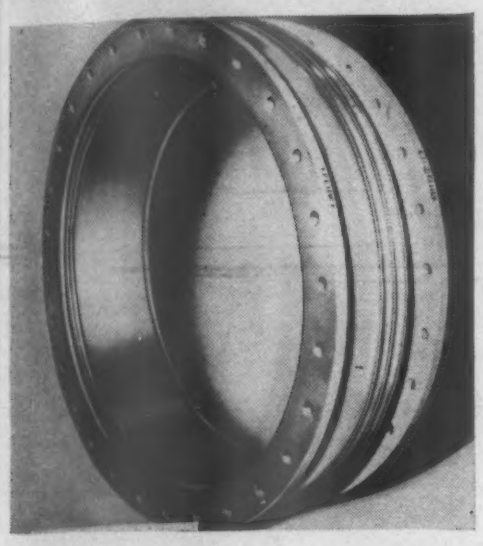
PRODUCTIVE POWE

Litho in

off prevents burn-outs, and a dial control regulates volume of dispersal. Electric cord is oil-resistant neoprene. Operates on a.c. or d.c. West Disinfecting Co., 42-16 West St., Long Island City 1, N. Y.

EXPANSION JOINTS

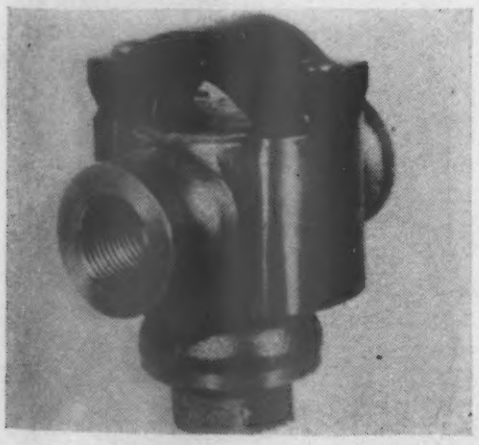
Low-pressure, packless expansion joints range in size from 14 inches to 6 feet in diameter. Applicable for all pipe sizes, temperatures, and pressures, they are



normally supplied in type 347 stainless steel for pressures up to 30 p.s.i., but other metals may be obtained. A 36-in. unit with three bellows flanges permits a 3-in. total movement. For greater travel requirements, additional bellows flanges may be added. MagniLastic Div., Cook Electric Co., 2700 Southport, Chicago 14.

MAGNETIC SCREEN TRAP

Mesh screen and an Eriez Alnico permanent magnet are built into a screen trap which, when placed in a liquid, vapor, gas, or air line, stops abrasive



material, magnetic and non-magnetic. Trap body is made of brass, bronze, or aluminum. Having no braces, stanchions, or supports, the screen offers an unobstructed filtering area. It is separable from the screw cap to facilitate cleaning or renewal. Cooney Valve & Screen Co., 5-F., P. O. Box 1358, Erie, Pa.

PROTECTIVE COATING

Black cold-applied protective coating known as Bituplastic, is a dispersion in water or refined plastic coal tar pitch

A practical, low-cost way to

Avoid Accidents

and IMPROVE MORALE...

DRY-clean your floors with a

TENNANT

Industrial Floor Machine

To make your plant "tops" with workers, floors must be *safe:* clean...smooth...free of slippery grime. And there's no faster, easier way to do the job than with a powerful, high-speed Tennant Industrial Floor Machine. It's usually 6 to 20 times faster than other methods... eliminates need for solvents or water... removes *all* kinds of grime... leaves your floor clean... safe... DRY.

REMOVES GRIME IN 1 OPERATION

Cuts grime loose from floor with high speed steel wire brush, steel wool roll or Revo-tool. Amazingly fast; pulverizes grime, grease, dirt, metal cuttings, etc.

Smooths and levels surface. Leaves safe, smooth floor—hard, dry, ready for use.

Picks up soilage to eliminate need for sweep-up after machine.

WRITE TODAY for complete details, bulletins, photos. Tells how to make your floors cleaner and safer—at less cost.

REVO-TOOL. 12" or 16" drum-mounted accessory for tough jobs, such as tar, dried paint, metal cuttings.

STEEL WIRE BRUSH. Excellent for grease, grime. Non-clogging.

STEEL WOOL ROLL. Best for dry-cleaning strip wood floors. Removes grime, leaves bright, smooth surface.

The way to finer floors

TENNANT

Floor Maintenance System

G. H. TENNANT CO.
2554 N. Second Street
Minneapolis 11, Minnesota

Floors, like roads, are safer when **DRY!**

Saves 750 lbs. dunnage per car

Water heater company cuts freight costs, reduces damage claims, saves time and labor with Acme Steelstrap

Acme Unit-Load Band practically eliminated freight damage claims, reduced labor costs and saved 750 lbs. of lumber dunnage per carload.

A shipping room production line is building more efficient packages with Acme Steelstrap. This saves 25% on each water heater package.

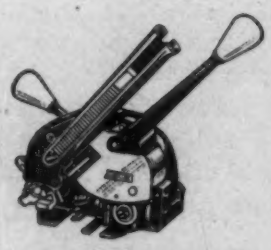
The extra expense of material and labor for bracing a car with heavy, costly lumber is a cost of distribution which can be reduced. Also that hidden cost, "claims for damages," can be eliminated.

This manufacturer of Portland, Oregon, asked Acme shipping specialists if Acme Unit-Load Band might be an answer to their water heater shipping problems. It was. This method saves 750 lbs. of lumber dunnage per carload and has proved to be a safer method of bracing cars.

While there the Acme experts also suggested an improved design for individual heater packages. This resulted in another 25% savings.

You are welcome to call in an Acme shipping specialist to consult with your organization on any shipping problem without obligation.

Write or send for booklet containing actual case histories of substantial savings made by Acme shipping specialists.



More savings ahead for Acme Steelstrap users—No. 3 Steelstrapper, the lightest tool made, is now available. Magazine holds 100 seals. Tensions, seals, and cuts the strap in one operation. Small base requires only 5-inch strapping surface. Two levers working in opposite directions make for better balance and easier handling.

Acme Steel Company, Dept. FM-67
2838 Archer Avenue, Chicago 8, Illinois

Gentlemen: Please send me a copy of your case history booklet, "SAVINGS IN SHIPPING."

Name .....

Company .....

Address .....

City..... State.....

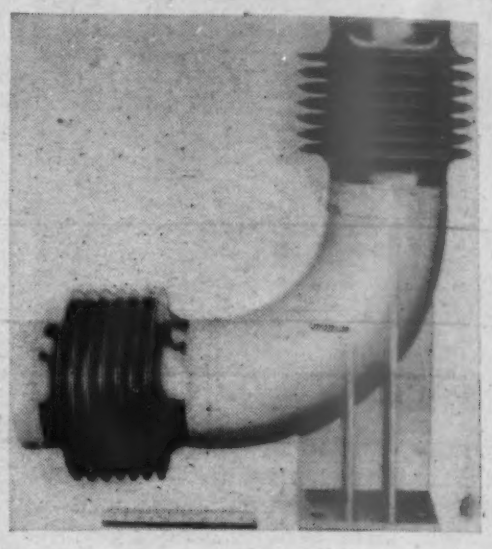
ACME STEEL COMPANY

ACME STEEL CO. CHICAGO

NEW YORK 7 ATLANTA CHICAGO 8 LOS ANGELES 11

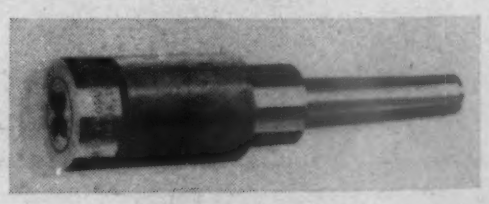
ELBOW EXPANSION JOINT

Packless anchor base elbow expansion joint is made in all standard pipe sizes, and in materials to meet corrosive, temperature, and pressure conditions. The 10-in. pipe size unit, approximately 4 feet high, accommodates 40-p.s.i. steam pressure, and is designed for operation at temperatures up to 360 deg. F. Magni-Lastic Div., Cook Electric Co., 2700 Southport, Chicago 14.



TAP AND DIE HOLDER

Providing a means of cutting external and internal threads on small runs of lathe turned parts, releasing tap and die holder is designed for use in screw machine and engine lathes. Made in three shank sizes—No. 2 Morse taper for engine lathe tailstock sockets, and in ⅝- and ¾-in. straight shank for use in screw machine turret heads. Standard 1-in. button type dies are used for external grinding or standard taps for tapping holes. The taps are held with 1-in. split bushings. It is assembled to prevent separation of parts, and ready to use. Falls Products, Inc., 104 North Genoa St., Genoa, Ill.

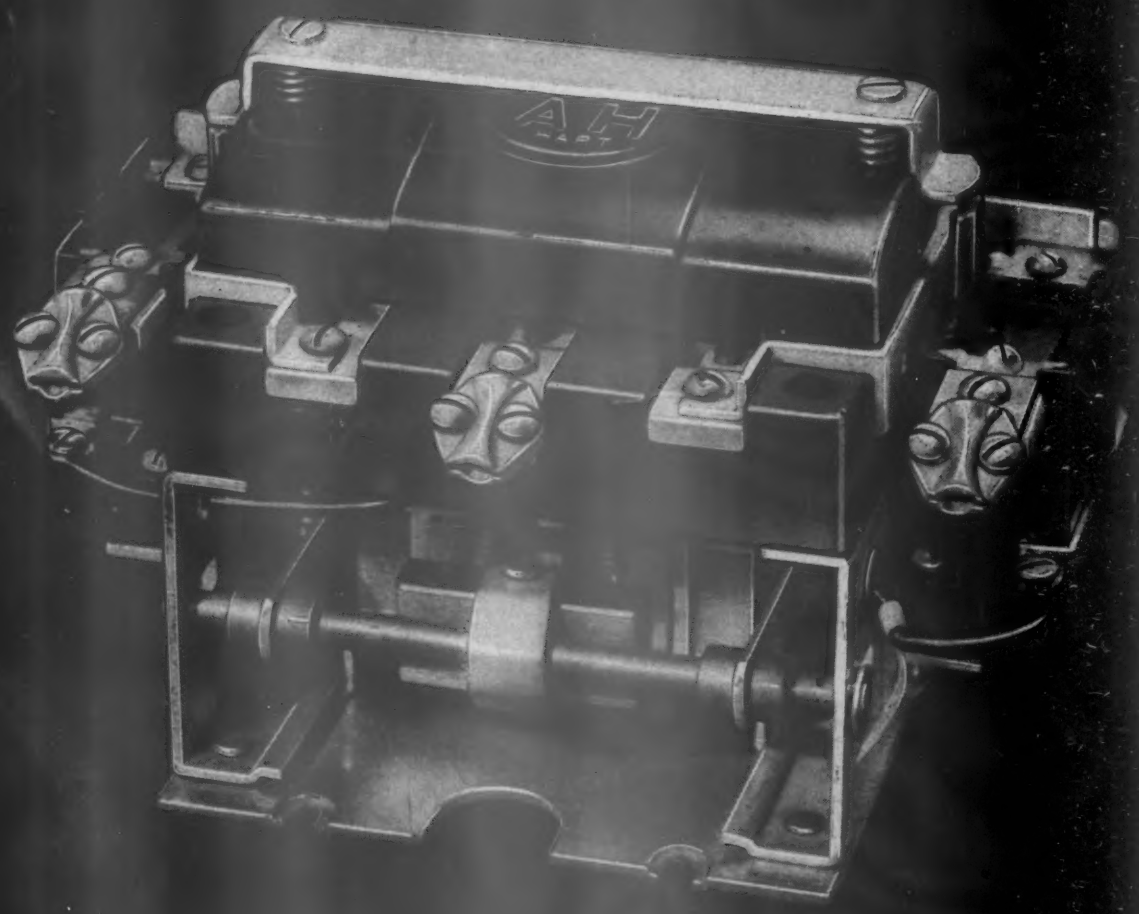


RUST PREVENTIVES

Said to dry to a firm, high melting point film, capable of protecting metal equipment in outdoor storage for as long as two years, Brayco 100 rust preventive is designed to meet extreme conditions of and other materials. It can be applied to damp surfaces whether metal, concrete, or masonry. Applied by brush or spray, it dries in from 15 minutes to 2 hours under average humidity and temperature conditions, and forms a tough film impervious to water. Contains no volatile organic solvents or noxious fumes, and is said to eliminate the danger of fire or explosion. Wailes Dove-Hermiston Corp., Westfield, N. J.

ARROW AH HART

NEW MAGNETIC STARTER



THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

IMPORTANT
assembly savings

RECONVERSION TIME is cost-cutting time. Many of the foremost machinery builders are finding that by simply *peeling* precision laminations from Laminum shims, much costly machining is made unnecessary in accurately fitting bearings, gears, etc. These savings are specific, and large enough to be important. Want performance data?

Laminum shims are cut to your specifications. For maintenance work, however, stock shim materials are sold through industrial supply houses.

Laminated Shim Company, Incorporated.
54 Union Street **Glenbrook, Conn.**

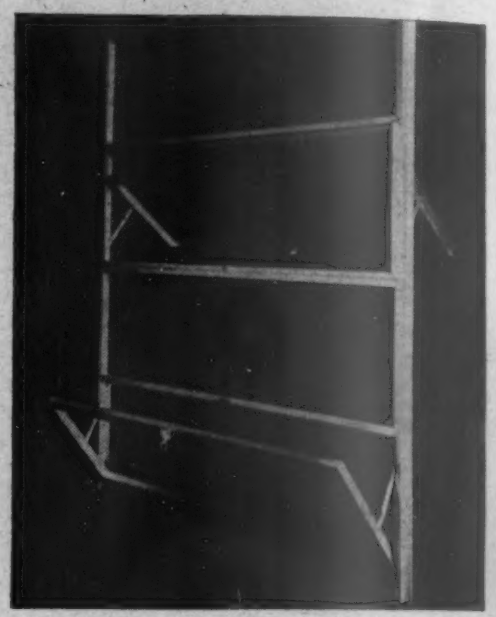
LAMINUM
TRADE MARK
THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

2218

humidity, heat, weathering, and cold. Can be diluted with solvent and sprayed on, or applied by brush. Also available is a grease-type lubricant which protects machined parts, machinery, and other equipment against rust for up to a year outdoors, and two to five years indoors. Known as Brayco 124, it resists heat. Age hardens the film, but it can be removed by wiping, or fluxed with regular lubricants, the manufacturer says. U. B. Bray Co., 3344 East Medford St., Los Angeles 33.

ALUMINUM WINDOWS

Windows of aluminum feature tubular construction, which is said to increase strength, to reduce cold penetration into the room, and to help diminish condensation. The Series 950 window, built to carry the weight of glass blocks without



use of lintels, is constructed with extruded glass block frame and sash member, for rigidity. Multiple fitting of standardized lengths of sash to frame and frame to continuous fin characterizes the Stormite 900 Series of casement projected windows. According to the manufacturer, this construction provides maximum strength with a minimum amount of material. The windows are modular type. Albert Storms & Co., 101 Park Ave., New York.

PROTECTIVE COATING

Series P-5 coating is compounded for the protection of metal, wood, and concrete against corrosion from moisture, acids, alkalis, and other disintegrating elements. It is said to be free from objectionable paint odors, non-toxic, and to dry by evaporation without requiring an oxidation period. Additional claims are thermal stability, abrasion and scrubbing resistance, good aging characteristics. The manufacturer says also that coating does not oxidize or become brittle. Industrial P-5 Div., The Watson-Standard Co., Galveston & Steppler Sts., Pittsburgh 30.

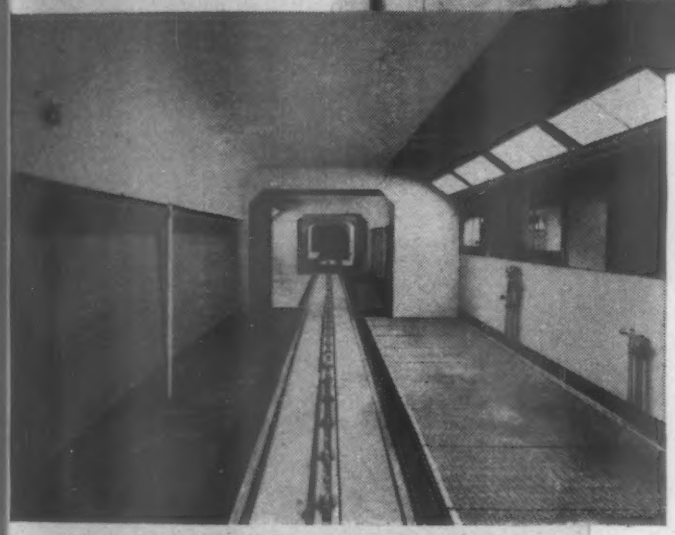
WATER DEMINERALIZER

Model U-60 "Filt-R-Stil" water demineralizer is designed to transform ordinary tap water into the chemical equivalent of distilled water. The equipment requires no heat, steam, or auxiliary equipment, and uses about the

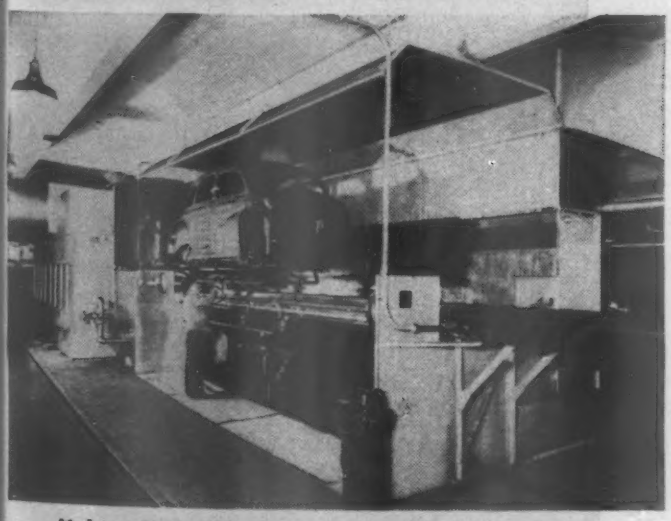
COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Above: Mahon Multiple Tunnel-Type Automobile Body Ovens in One of the World's Finest Finishing Systems. At Right: Exterior of the Same Ovens showing Heating Units and Automatic Temperature Control Panels.



Interior of Mahon Hydro-Filter Spray Booths Designed for Automobile Body Production.



Mahon Hydro-Filter Spray Booths Designed for Painting Underside of Automobile Bodies.

. . . Modern, Efficient Equipment Is An Investment in Future Profits!

Because Finishing Systems are an investment in future profits, you cannot afford to consider anything but the best available. Finishing Equipment bought on price alone may, in a short period of time, prove more costly than a Mahon System . . . because, errors in judgment in equipment of this type directly affect your production costs, saleability of your product, and, ultimately, your profits—too many case histories verify this. To produce the results you have the right to expect, Finishing Systems must be properly planned throughout with respect to production layout and requirements; they must be carefully engineered and coordinated by experts who know all the answers from metal cleaning through final finish-coat baking. The Mahon organization provides that kind of planning and engineering. Twenty-five years of experience in this highly specialized field, supplemented by constant research and pioneering development, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or, if you are contemplating new finishing equipment in the near future, consult Mahon engineers today.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 11, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems including: Metal Cleaning Machines, Rust-Proofing Machines, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Units, and Drying and Baking Ovens. Also Paint Reclaiming Units, Hydro-Foam Dust Collectors, and many other Units of Production Equipment.

MAHON

53% More Fire-Fighting Power

with the NEW Ansul-Dugas Dry Chemical Fire Extinguisher

Engineered to provide 53% more and faster fire-stopping power, the NEW Ansul-Dugas Fire Extinguisher is ready to use—IN A FLASH—on Class B and C fires. The wide heat-shielding stream of Ansul Plus-Fifty Dry Chemical from the specially designed nozzle makes extinguishing more certain even by inexperienced employees.

STOP FIRE FASTER!

HERE ARE OTHER PLUS FEATURES

- Quicker, easier, on-the-spot recharge right after use.
- Highest Rating for SPEED and EFFECTIVENESS as determined by impartial authority.*
- New, wider coverage type nozzle with long range effectiveness.
- Greater fire-fighting power pound for pound, dollar for dollar.
- Increased fire-fighting capacity without increased weight.
- Engineered to resist corrosion.
- Ansul Plus-Fifty Dry Chemical is nontoxic, non-abrasive, non-corrosive.

*Write for charts based on authoritative data of comparative ratings as determined by a national approval agency.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

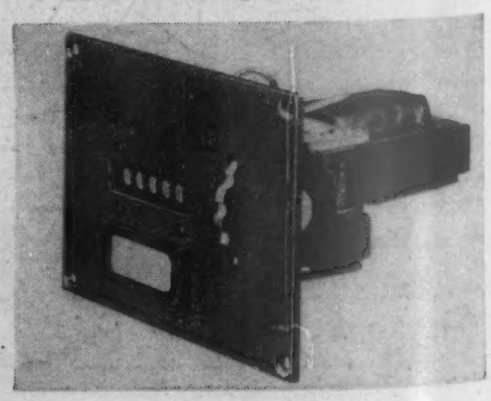
same amount of electricity as a 6-watt bulb. Operating at a 60-g.p.h. flow rate, it can be used to deliver water containing a maximum of 10 parts per million of ionized solids, or as little as 1 part per million. Built-in adjustable controller indicates the quality of the treated water, measures electrical resistance, and actuates a red light when it falls below 50,000 ohms. Ion Exchange Products Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York 20.

CLEANING POWDER

A white free-flowing powder, cleaner No. 100 is soluble in hot or cold water. It is a blend of mild alkaline materials, including water softening ingredients, is free rinsing, and, at low concentrations, is soft on the skin, maker says. Can be used for light-duty plant maintenance cleaning and in power spray washing machines. Removes light oils, grease, and dirt, and may be used on ferrous or non-ferrous metals. Cleaner No. 100-A contains the same materials, but includes a synthetic wetting agent. Available in 100- and 400-lb. containers. Optimus Detergents Co., 64 Water St., Matawan, N. J.

ELECTRIC COUNTERS

Electrically operated counters are arranged for flush-mounted installation, reading, and reset from the front of the panel. Called Wizard Panelmount, the counters can be mounted on a panel with other flush-mounted instruments, or on individual machines. The counter is equipped with subpanel, and is actuated



Just a few minutes a day . . .

...at AO we try to practice what we preach!

American Optical Company, in competition with 325 companies has won the state-wide accident prevention contest for 1946 and has received the Grand Trophy presented annually to that Massachusetts concern judged to be the safest in which to work. We prize this honor highly, not for the trophy merely, but because the attainment of the safest working conditions for our employees, earned through unremitting effort, is its own reward. In this spirit, we are also pleased that the award in the Commercial Vehicle Accident Reduction Contest was won by AO for operating its trucks during 1946 without accidents.

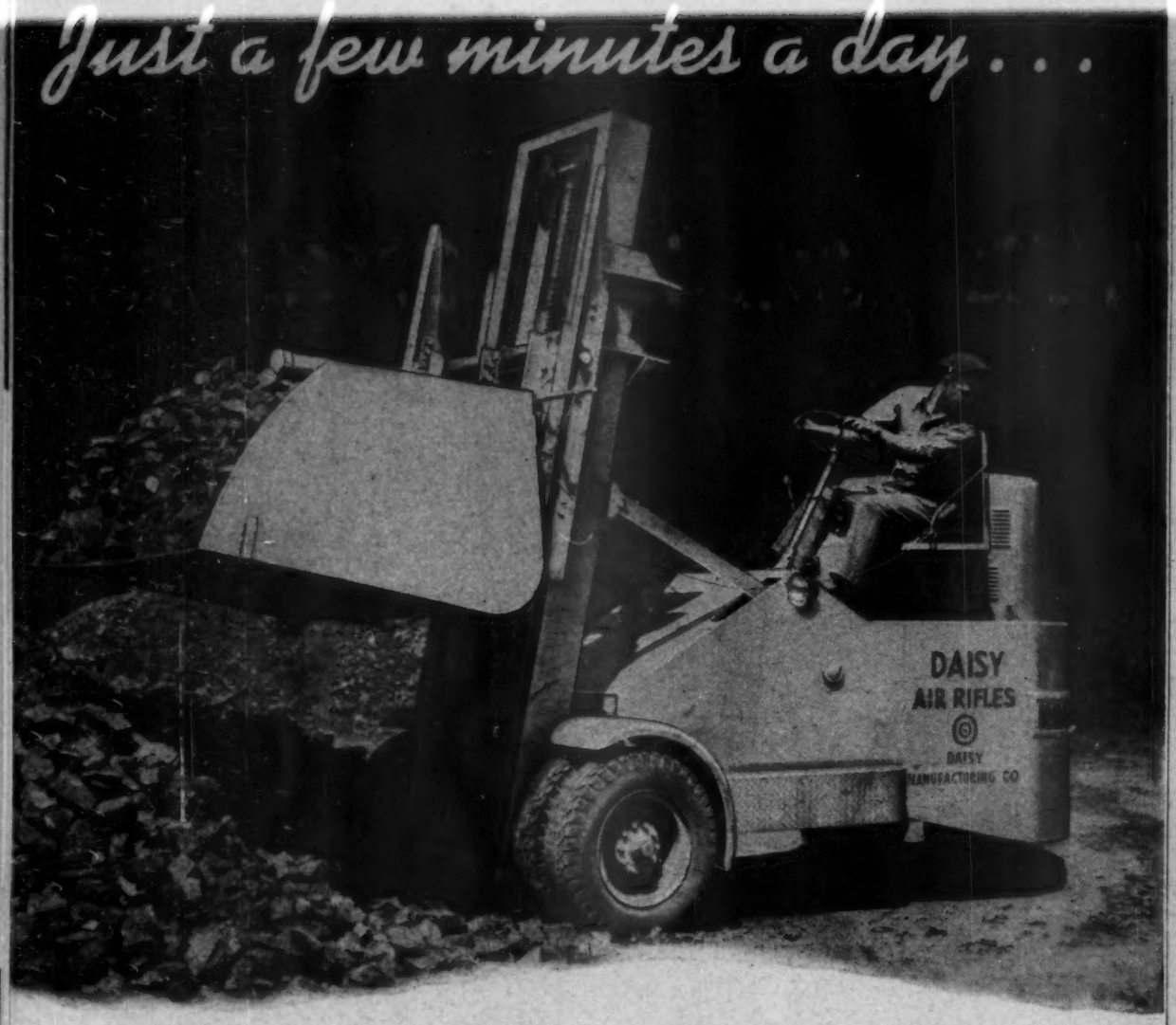
At AO we try to practice what we preach... it *pays off* in dollars and cents! Our eye-accident prevention and eye-protection program includes vision checks and examinations, corrective glasses if needed, safety-goggles for employees with defective vision, and occupational glasses for employees on jobs requiring special visual skills and attention.

Your nearest AO representative can supply complete details about a program which can improve worker output and morale, reduce accidents and spoilage and lower production costs. Ask him to call.

American Optical Company — *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Just a few minutes a day . . .



AT *Daisy* MANUFACTURING COMPANY

ROSS LIFT TRUCK DOES DOUBLE DUTY

Here's a job that's typical of the many ways ROSS adaptability pays off for owners.

Daisy Mfg. Co., makers of the world's most famous air-rifle, use a standard ROSS Lift Truck equipped with 2 cu. yd. ROSS scoop to feed coal from stockpiles to boiler room bunkers. This machine enables one man to handle as much coal in a few minutes as two or more men and an ordinary truck formerly did in several hours. The lift truck carries approximately 3600 pounds of coal per trip — and makes a 200 yard round trip in five minutes or less.

And when this job is done, the operator makes a quick switch to standard forks. Then this same lift truck goes back to its regular work — handling the sheet steel, bar stock and other items that go into the manufacture of air rifles.

You too will find that ROSS Pneumatic Tired LIFT TRUCKS (sure-footed on rough ground, snow or mud) quickly pay for themselves on an endless variety of work. Get all the facts about these versatile machines — capacities, 6,000 to 18,000 pounds.

Rely On ROSS

THE ROSS CARRIER CO.

295 MILLER STREET, BENTON HARBOR, MICHIGAN, U.S.A.

Direct Factory Branches and Distributors Throughout the World

by any suitable switch, relay, or photo-electric unit. Can be remotely located. Multiple-mounted units can be arranged to maintain a continuous count on each of various machines, operations, or movements of parts, materials, or packages. Made in 4- and 6-digit models with knob or key reset, they can be furnished in voltages up to 220 a.c. or d.c. Production Instrument Co., 700-06 West Jackson Blvd., Chicago 6.

CHAIN HOIST

Use of steel and aluminum alloys in line of high-speed hand-operated hoists is said to reduce weight almost 45 per cent, while increasing strength and durability. Excess bulk is eliminated by reduction

in number of component parts. All rotating parts are fitted with permanently lubricated ball bearings. A light pull unlocks brake and lowers the load, which is under operator's control at all times, according to the manufacturer. Known as the Cyclone Model M, the hoist is available in ¼-, ½-, 1-, and 2-ton capacities. Equipped with "Herc-Alloy" steel chain. Chisholm-Moore Hoist Corp, Tonawanda, N. Y.

ELECTRICAL TESTER

Pocket-sized electrical appliance tester Model 390 gives volt, ampere, and wattage readings. The instrument is furnished with a break-in plug which has four color-coded leads. The meter has

Get more out of your training program ...with films

more interest

more progress

more production

You can get so much more out of your training program—with films!

You get more interest because films enable you to present processes and procedures in a fresh, lively, colorful way . . . to dramatize shop situations that might otherwise seem dull.

You get quicker mastery of skills . . . and, as a result, more production . . . because the medium's unique combination of pictures, motion, color, and sound enables you to *demonstrate* technics more thoroughly...as well as more graphically.

Other programs can be made more effective with films, too. With motion pictures or slide films, you can present the results of carelessness and clowning most dramatically . . . keep workers "sold" on safety. And with this same colorful medium, you can inject new spark . . . new conviction . . . into your programs devoted to health and to employee-relations.

Two ways to get the films you need. For help in locating "ready-made" training films that can be rented or purchased very reasonably—sometimes borrowed—write us for a free copy of "The Index of Training Films." For help in planning and producing your own, see a commercial producer.

EASTMAN KODAK COMPANY
Rochester 4, N. Y.

Industrial Films...another important function of photography

Kodak

HANDLING HEAT with Abrasives

4000°

Handling the high temperatures used by modern industry is a tough job—it requires materials with rugged physical and thermal properties. Norton has such materials in Alundum and Crystolon abrasives. Their creation in electric furnaces at temperatures of 3700° and 4000° Fahrenheit gives them valuable refractory properties as well as abrasive qualities. And supplementing these two materials there are several Norton electric furnace products which are produced especially for their unique refractory properties.

You'll find these various refractory materials put to effective use in Norton cements, tubes, bricks, plates, tiles and other shapes for

METAL MELTING FURNACES
HEAT TREATING FURNACES
ENAMELING FURNACES
CERAMIC KILNS
BOILER FIREBOXES
GAS GENERATORS
CHEMICAL PROCESSES

If you use high temperatures there are Norton refractory products that will handle heat for you most efficiently. Norton refractory engineers are ready to help you in their selection.

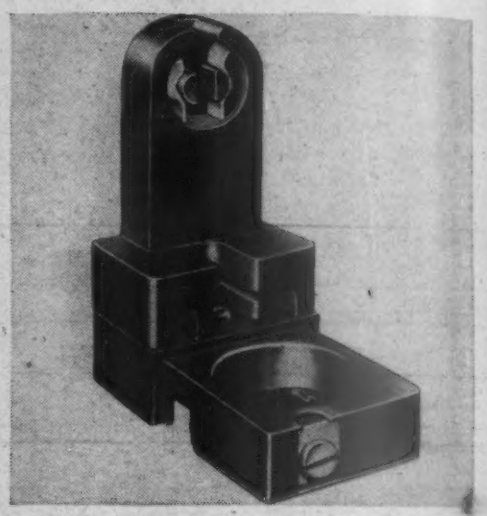
NORTON COMPANY
WORCESTER 6, MASS.
(BEHR-MANNING, TROY, NEW YORK IS A NORTON DIVISION)

NORTON

a large scale and wattmeter scale with equal graduations. Ranges are a.c. 60 cycles; volts 0-150, 0-300; amperes 0-3, 0-15; watts 0-300, 0-600, 0-1500, 0-3000. Carrying cases with compartments for break-in plug and leads are furnished. Simpson Electric Co., 5208 West Kinzie, Chicago.

LAMP HOLDERS

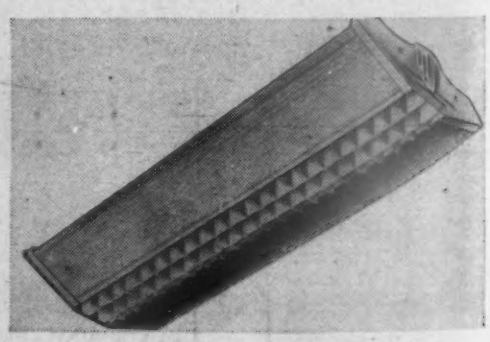
Fluorescent lamp holders and lampholder starter sockets are made of chipproof, shockproof bakelite with high dialectric strength. One-piece construction is said to prevent fractures or chipping, and to strengthen structural design. Insertion and renewal of lamp and



starter are simple and permit one-hand servicing. Slots in lamp holders guide lamp ends into position, and a twist of the lamp locks it. The lamp holders and starter socket combinations fit standard fluorescent strips, troffers, luminaires, and other equipment. Solar Electric Corp., Warren, Pa.

FLUORESCENT LIGHTING

Named Vanguard, an addition to the Silv-A-King line of fluorescent lighting equipment is of a modified "V" design with egg-crate louvers for maximum shielding of lamps and adequate lighting diffusion. The side panels of frosted



ribbed glass are top-hinged to facilitate maintenance. Slotted end sections contribute light to eliminate dark ends. Precision-fitted canopy and stems are optional. The units may be mounted in continuous rows without removing the ends or using special parts or fittings. Bright Light Reflector Co., Bridgeport, Conn.

CIRCUIT BREAKER

Compact 225-ampere frame industrial circuit breaker, known as Type ML-3, is smaller model of the ML-2, 100-ampere

"Buy a Valve with 9 Lives, Mister!"

TO ANY MAN who keeps his business-wise eye on the black side of his ledger, one fundamental truth will be more than apparent today. And that is, with rising wage levels, valve upkeep may well outweigh original purchase prices.

That is why today, more than ever before, it is important to buy valves that need not be pampered at the expense of maintenance. When you buy Jenkins Valves you can be sure that, with proper treatment, they will last longer, serve better, and save you more money in the long run than any other valves made. Almost a hundred years in business has proved this to be an established fact.

And so, regardless of whether it is a question of original installation, or whether it's replacement, consider Jenkins Valves. Jenkins Bros. Engineers are always glad to help solve your valve problems. Sold through reliable Industrial Distributors everywhere.

Jenkins Bros., 80 White Street, New York 13; Bridgeport; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal, Canada.

LOOK FOR THIS TRADE JENKINS MARK DIAMOND MARK

SINCE 1864 Jenkins Bros

JENKINS VALVES

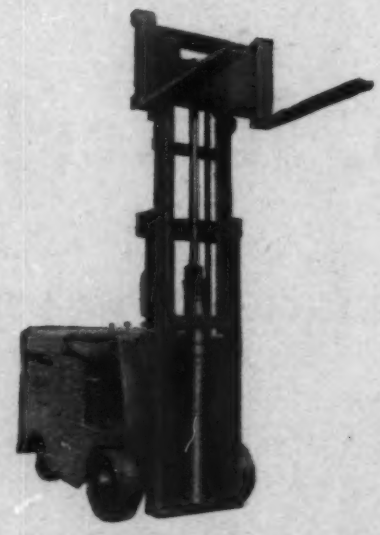
Types, Sizes, Pressures, Metals for Every Need

"We needed additional warehousing space—badly. First, we had thought of adding a bay or a new wing. The Crescent Electric PALLETIER proved to be a far less expensive addition. All the space we required became available—free. Vertical space—never before used. Now, tier after tier of our palletized materials are stacked to ceiling height."

The power-packed PALLETIER maneuvers easily in close quarters, climbs ramps, steps up loading and unloading of freight cars, ends demurrage. Users find that *one man replaces a crew,* lifting, transporting, stacking—easily, speedily, safely.

The Crescent Electric PALLETIER is available in 1000, 2000, 3000, 4000 and 6000 pound capacities. Write for free bulletins today.

CRESCENT TRUCK COMPANY
1100 Willow St. • Lebanon, Pa.
Member Electrical Industrial Truck Association

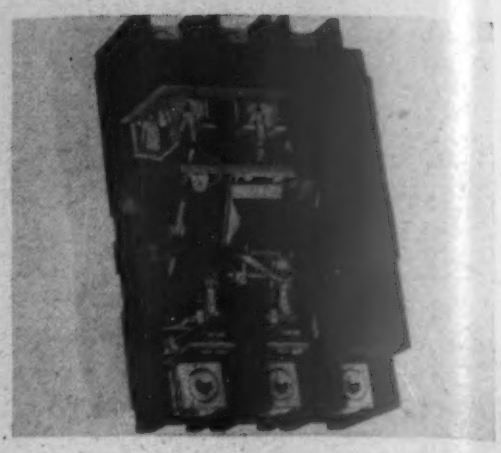


ELECTRIC Crescent PALLETIER

PALLETIER ADVANTAGES

- Operator spots and tiers without stirring from seat.
- All control levers at driver's fingertips.
- Full magnetic control protects against forced acceleration.
- Inspections and adjustments simplified by easy accessibility to all mechanisms.
- Minimum maintenance costs.

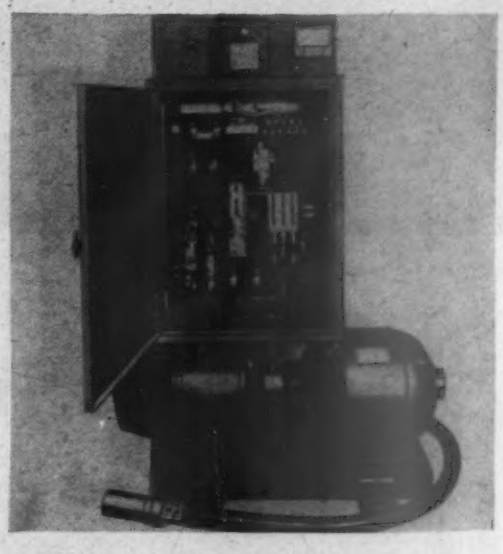
This is the truck to take loads off your mind.



frame breaker. Measures 10⅜ inches high by 6 inches wide. Solderless connector facilitates insertion of heavy cable by swinging open the hinged top of the lug. Trip ratings are 125 to 225 amperes. Voltages are 125-250 volts d.c.-250 volts a.c., 600 volts a.c.-250 volts d.c. The breaker is available in sheet steel dust-resisting enclosures with side operated handle for 3- and 4-wire solid neutral applications in addition to 2- and 3-pole devices. Also furnished in panelboards and switchboards, front- or back-connected. Square D Co., 6060 Rivard St., Detroit 11.

BATTERY CHARGER

Heavy-duty automatic battery charging equipment for industrial truck service is packaged in one unit consisting of a single-circuit motor-generator set, with control cabinet mounted on a welded structural steel framework directly above. Meets the requirements of an 18-cell, 550-amp. hour, lead acid type storage battery. The generator is a 47-volt d.c. machine. For adjustment of voltage, a slide-wire type resistor is used in the



field circuit, preventing tampering with the voltage after it has been set. Controls are heavy-duty type. Line contactor is of steel mill construction, and motor starter is Size 2 across-the-line type. Motor Div., General Electric Co., Schenectady.

HIGH-SPEED INDICATOR

Suitable for use where a large number of thermocouple temperatures must be logged in a short time, the Speedomax indicator is claimed to feature high sensitivity and accuracy, even for low temperatures and short ranges. Scale has wide markings. Switching arrangements can be supplied to meet different

New–

Gulf Soluble Cutting Oil

Helps increase output and tool life!

Gulf Quality Cutting Oils

Gulf Lasupar Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
Gulf M-L Cutting Oils A, B, and C
Gulf Cut-Aid
Gulf Cutx B
Gulf L. S. Cutting Base A and B
Gulf Soluble Cutting Oil A

GULF SOLUBLE CUTTING OIL is setting new standards of performance for this type of cutting fluid in scores of shops!

Gulf Soluble Cutting Oil combines high cooling efficiency and superior lubricating qualities—a combination that insures maximum production and tool life and fine finishes on the work.

Other quality features of this new Gulf product include improved miscibility, exceptional stability, effective rust preventive properties, pleasant odor—and it's nonfoaming.

Call in a Gulf Lubrication Engineer today and let him demonstrate the many advantages of the new Gulf Soluble Cutting Oil in your shop. Or send the coupon below for folder which gives you further information.

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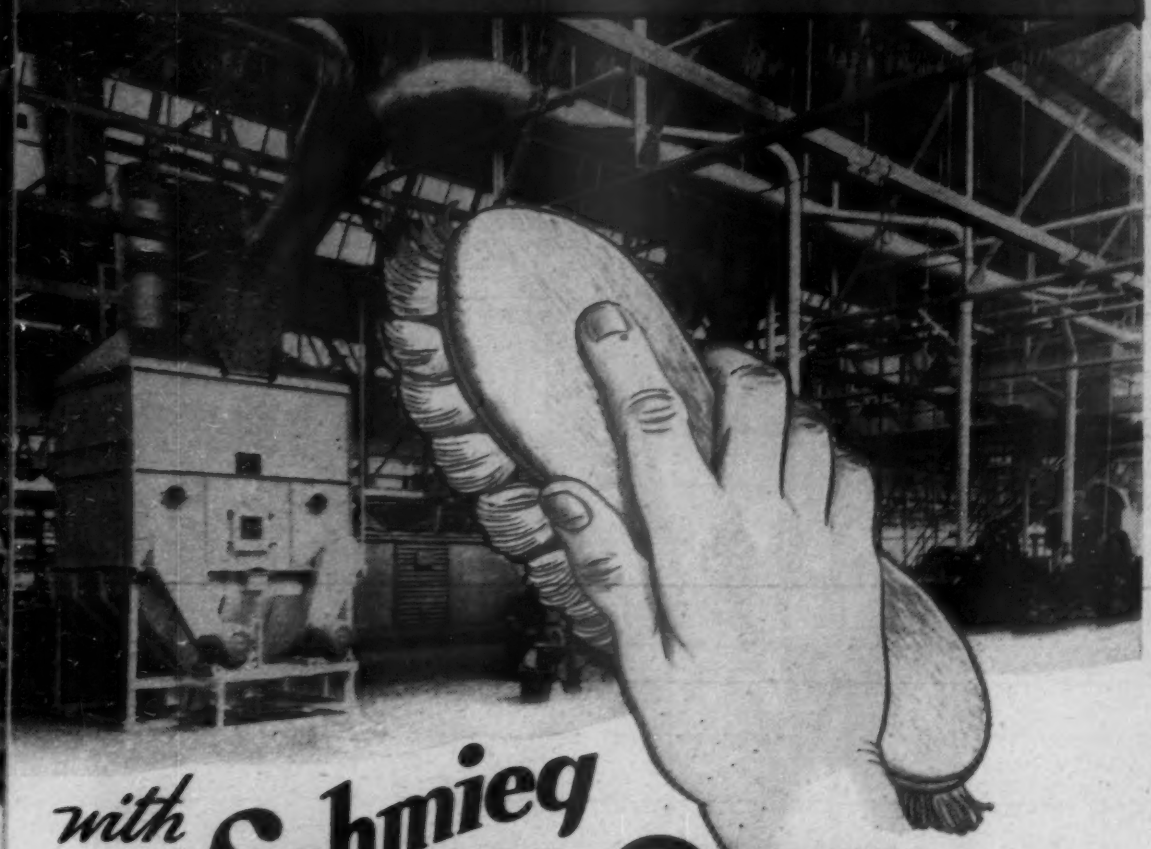
Address.....

SCRUB... *the* AIR *in your plant* CLEAN



with Schmieg CENTRI MERGE

Automatic **DUST and FUME** *Eliminator*

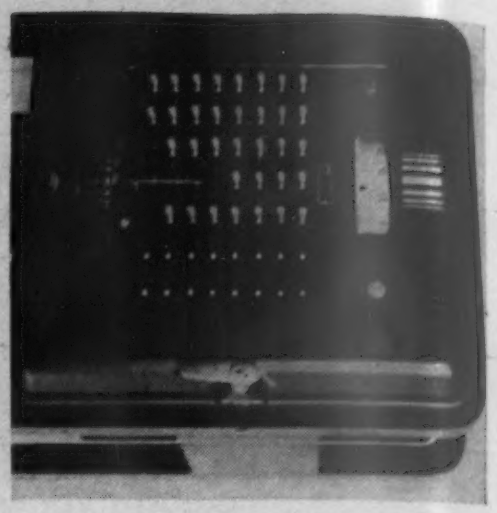
Dust and fumes don't get a chance to circulate in plants equipped with a Schmieg CENTRI-MERGE Eliminator. The moment dust or fumes develop from buffing, burring, grinding, polishing, curing or any other processing operation, they are swept up on an air stream that carries them back through ducts to a central Collection Unit. In the washing chamber of this Unit the CENTRI-MERGE high pressure centrifugal water action literally *scrubs* every last vestige of contamination from the air stream—cleans it so thoroughly that, in many cases, it can be recirculated back into the plant. That's why users are so enthusiastic about what CENTRI-MERGE accomplishes. Protects both workmen and work.

Consult Schmieg engineers regarding your problems of dust and fume control.

THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

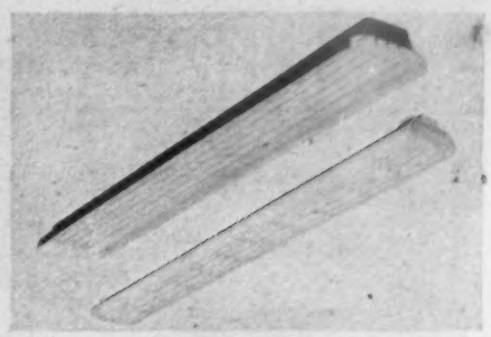
30[illegible] ROQUETTE AVENUE • DETROIT 2, MICHIGAN



needs. A single instrument handles more than 100 thermocouples. Key switches can be color-coded for convenience in identifying points. Amplifier unit uses standard vacuum tubes. The indicator fits in standard panel cutouts. Standard ranges for industrial thermocouples can be supplied if desired. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44.

FLUORESCENT FIXTURES

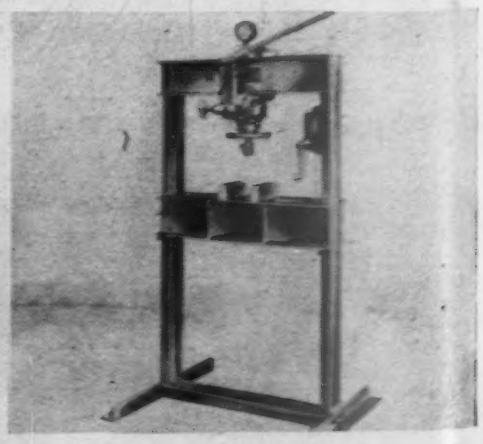
Series of fluorescent fixtures, known as New Horizon, uses slimline tubes. The line includes a Trofferlite. The lamps



are 12 inches wide, 98 inches long, and 6 inches high. Among the advantages claimed is lower surface brightness Leader Electric Mfg. Co., 6127 North Broadway, Chicago 40.

HYDRAULIC PRESS

Built for maintenance and industrial use, 25-ton hydraulic press, Model 25H, features a fast-moving ram speeded by extra-large pump. Press is constructed with reinforced arc-welded steel channel. A large space between uprights allows handling work up to 33½ inches in diameter. The screw-type ram can be advanced by hand to speed operation Standard equipment includes two combination table and V-blocks, round nose



Electric industrial trucks powered by GOULD KATHANODE BATTERIES are your lowest cost material handlers.

Relatively noiseless and without exhaust fumes, electric industrial trucks fit into every type of material handling operation. For many American industries, both large and small, they are speeding deliveries, simplifying storage and cutting costs.

Gould research has created a special battery to meet the power demands of the modern electric truck. This is the Gould Kathanode with its glass mat construction that maintains capacity and insures long life. It has the power and endurance that mean big league performance.

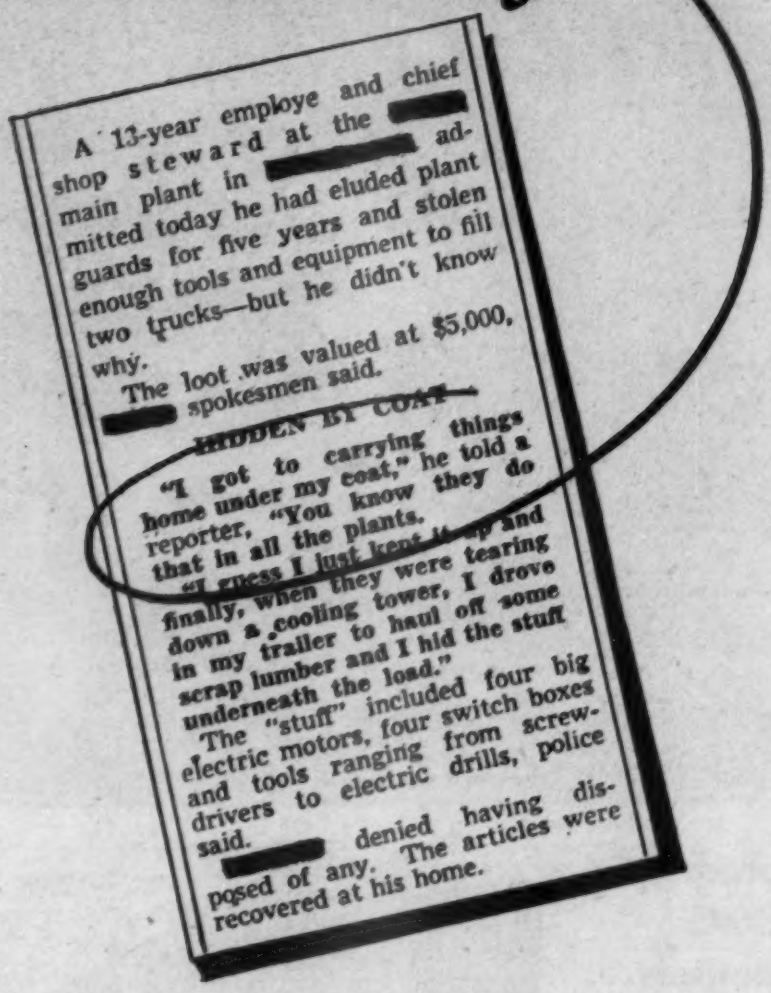
Write for Catalog 100 on Gould Kathanode Batteries for Industrial Truck and Tractor Service. Address Dept. 15, Gould Storage Battery Corporation, Depew, New York.

The Battery Picked by Engineers

GOULD KATHANODE BATTERIES

GOULD STORAGE BATTERY CORPORATION, Depew, N. Y.
Service Centers: Chicago Heights, Ill. • Cincinnati, Ohio • Cleveland, Ohio Depew, N. Y. • Detroit, Mich. • East Point, Ga. • Kansas City, Mo. • Los Angeles, Cal. • Marlboro, Mass. • New York, N. Y. • Philadelphia, Pa. • Pittsburgh, Pa. St. Louis, Mo. • St. Paul, Minn. • San Francisco, Cal. • West Salem, Ore. Zanesville, Ohio • Kingston, Ont.

Are You too losing tools this way?



A 13-year employe and chief shop steward at the [redacted] main plant in [redacted] admitted today he had eluded plant guards for five years and stolen enough tools and equipment to fill two trucks—but he didn't know why.

The loot was valued at $5,000, [redacted] spokesmen said.

HIDDEN BY COAT

"I got to carrying things home under my coat," he told a reporter, "You know they do that in all the plants.

"I guess I just kept it up and finally, when they were tearing down a cooling tower, I drove in my trailer to haul off some scrap lumber and I hid the stuff underneath the load."

The "stuff" included four big electric motors, four switch boxes and tools ranging from screw-drivers to electric drills, police said.

[redacted] denied having disposed of any. The articles were recovered at his home.

Every one recognizes the fact that tools disappear this way, when antiquated checking systems are used. Do you realize how much these losses amount to every year *in your own plant?*

Unless you have complete control of the tools in your cribs you can not know. You can be sure though that such hidden losses are adding many dollars to your costs.

McCaskey Tool Control will stop them by making each employee 100% responsible for every tool loaned to him—by accounting for all of your tools all the time whether in or out of the crib—by reducing tool inventories—by cutting breakage—by locating and preventing numerous "hidden losses."

Why not make it impossible for an employee in your plant to say, "You know they do that in all the plants"? Investigate and adopt McCaskey Tool Control now!

Whether you have one or several cribs for production or maintenance work, McCaskey Control will cut your tool costs and prevent production delays. Write for reports of cost-reduction and improved operations in several well-known plants.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

for pressing, pressure gage, and table-hoisting mechanism. The gage and table hoist are optional. Dake Engine Co., Grand Haven, Mich.

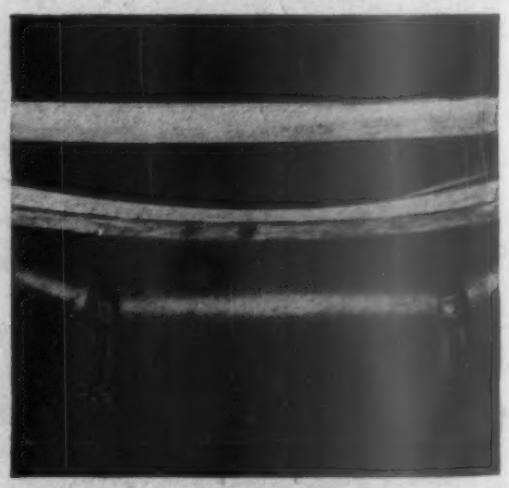
SUSPENDED OIL FURNACE

Suspended from the ceiling where it is out of the way, Superfex Model 550 automatic oil furnace saves floor space. Weighing 650 pounds, it can be attached to existing ceiling beams or girders without additional structural support. Thermostatic control starts the burner and turns on the blower when heat is needed. Axial flow blower provides

forced circulation of filtered air throughout the space being heated. Heavy-duty 2-stage pump draws fuel to the burner from an outside storage tank. The pressure atomizing burner utilizes No. 3 fuel oil, and has a rated output of 200,000 B.t.u. per hour. It is claimed that occasional oiling of the motor and cleaning of the oil filters is the only maintenance required. Perfection Stove Co., 7609 Platt Ave., Cleveland.

CONVEYOR BELT

Textile construction of nylon and Ustex yarn is said to increase strength of conveyor belt for transporting coal, packaged products, and other bulky materials over long distances. It features low strength lengthwise, and increased flexibility crosswise, permitting use of more plies, and length of the belt eliminates many transfer points and extra driving mechanisms, manufacturer states. The



belt can be spliced for installations where it is delivered in sections and made endless at the operating site, and in the event of accidental damage, repairs can be made. United States Rubber Co., Rockefeller Center, New York.

ADJUSTABLE SAW TRACK

Structural steel welded track is adjustable for use with safety saws W7, W8, and W9 for square, bevel, or bevel miter cuts. It eliminates laying out and mark-

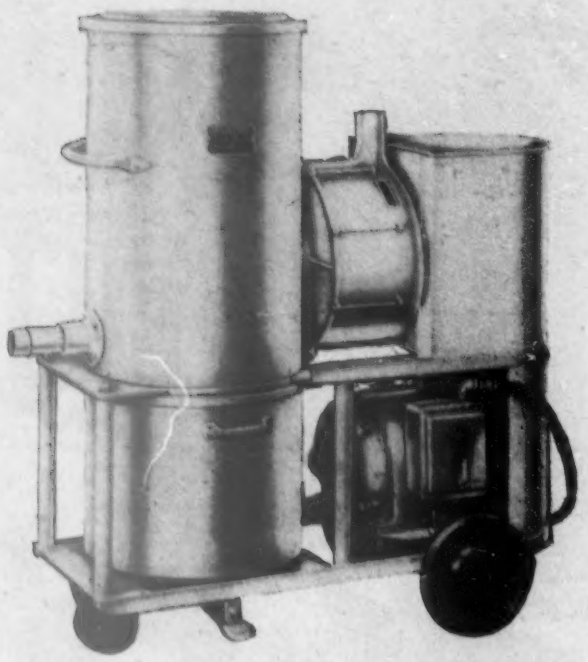
INVINCIBLE

Vacuum Cleaners help keep plants Clean, Safe, Productive

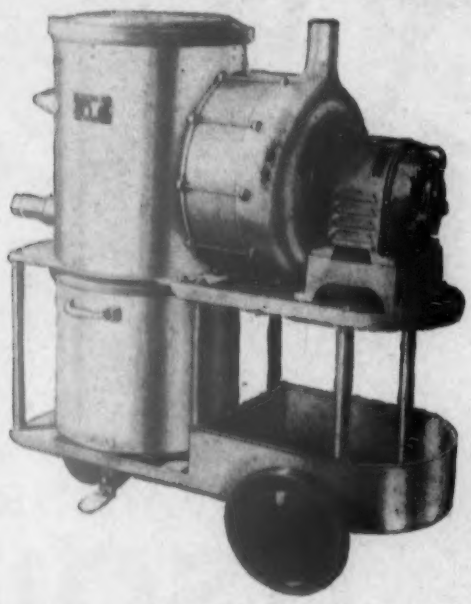
Regardless of your business, dust and dirt in your plant can be removed quickly, thoroughly and at least over-all cost with Invincible Vacuum Cleaners . . . And a clean plant produces healthful and efficient working conditions.

Invincibles are also contributing mightily to industrial progress by removing or reclaiming scores of industrial materials other than dust and dirt.

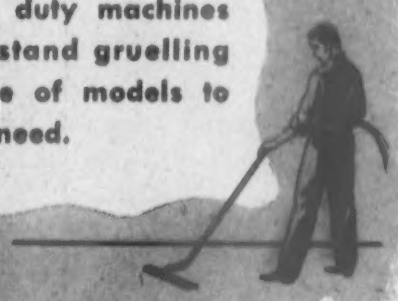
These portable heavy duty machines are designed to withstand gruelling service. A wide range of models to meet every industrial need.

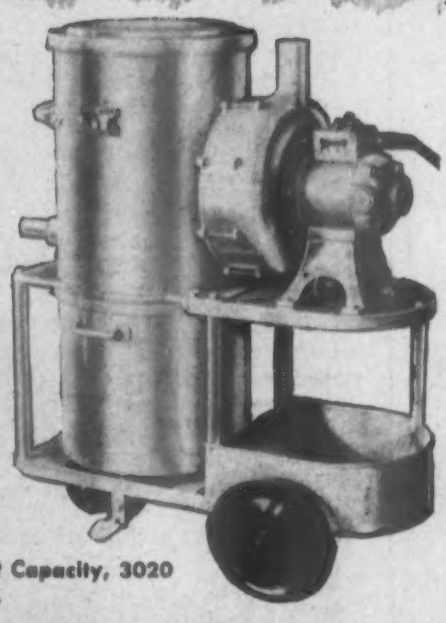


MODEL 809-B—3 H.P. Dirt Capacity, 3 cubic feet.



MODEL 460—1½ H.P. Dirt Capacity, 3020 cubic inches.





MODEL 450
1½ H.P. Dirt Capacity, 3020 cubic inches.

ALL SERVICE
½ H.P. Dirt Capacity, 950 cubic inches.

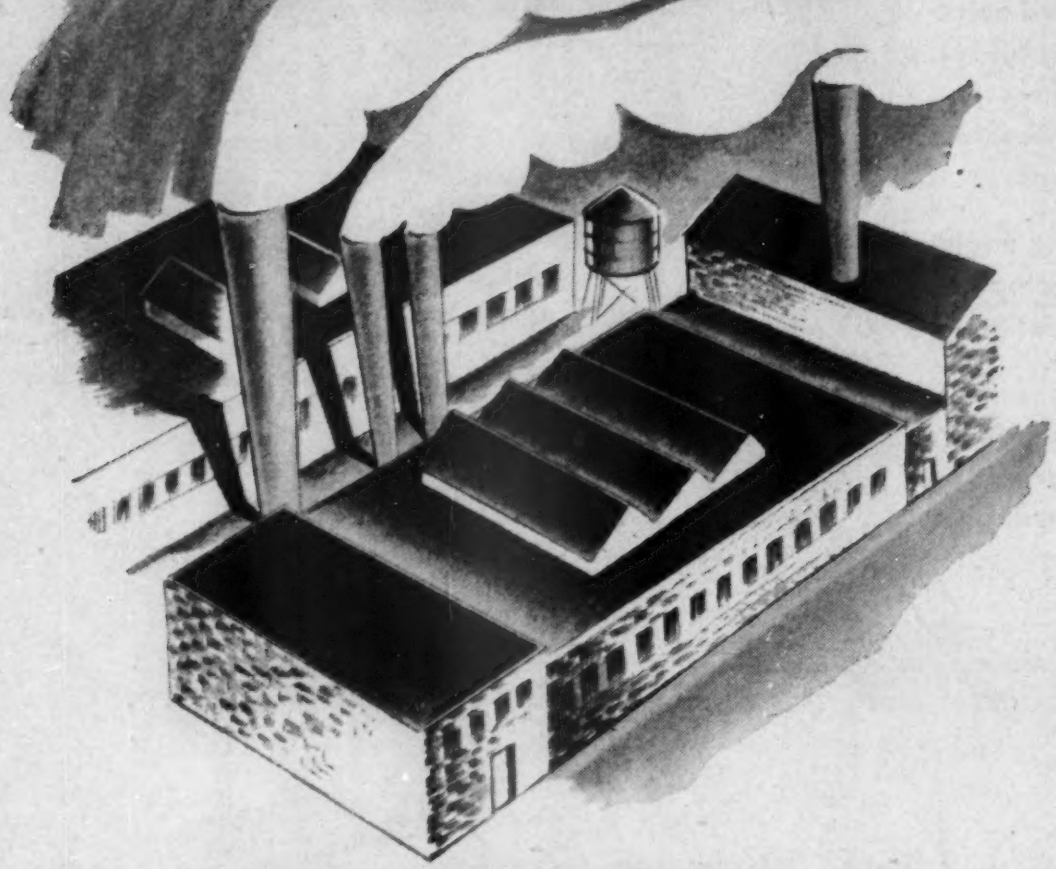
SEND FOR BOOKLET — It tells —
- . . . About the 100,000 Invincibles now in service
- . . . About our 40 years experience in this field
- . . . How Invincibles clean every spot in the plant
- . . . About the many materials reclaimed or removed

INVINCIBLE

Vacuum Cleaner Mfg. Co.

Dover, Ohio

Don't Neglect Your ROOFS



VALDURA

Asgum

ROOF PROTECTION

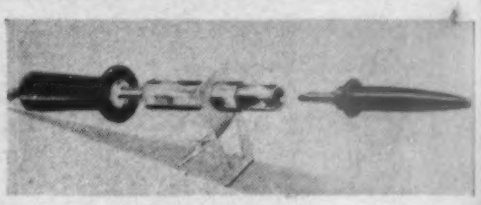
VALDURA Asgum Roof Protection preserves the original elasticity of new roofs—restores volatile oils to roofs that are weather-dried. Its waterproofing qualities render metal roofs impervious to rust-incipient moisture. Compare the 25-35 year length of service assured by Asgum-protected roofs with 5-6 years normal when roofs are not treated. Developed for use on all types of roofs—felt, composition, metal, or "built-up", VALDURA Asgum Roof Protection waterproofs, preserves, and renews your roofing dollars. See your Valdura Dealer.

AMERICAN-MARIETTA CO. VALDURA PAINTS THAT ENDURE **43 East Ohio St., Chicago, Ill.**

ing each piece of lumber, and cuts to size desired. Can also be used for cutting slate, marble, and other materials when proper abrasive wheel is used. Dimensions: 37-in. over-all length, 7¾-in. width, 4½-in. maximum height under track, cuts wood up to 17½-in. width, and has 34¼-in. over-all track length. Stanley Electric Tools, Div. of The Stanley Works, New Britain, Conn.

SOLDERING TOOL

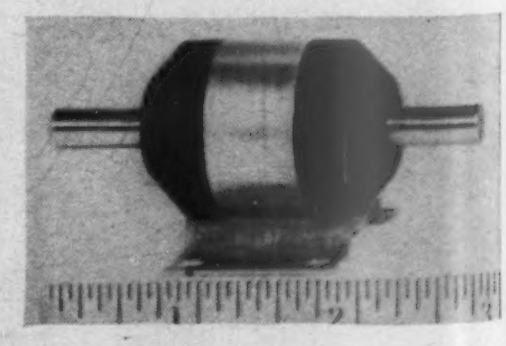
Kordless Kwikheat pencil-type soldering tool can be used for small switches, electric meter work, instruments, and other delicate operations. The heater-receptacle can be screwed in any size Kwikheat electric soldering iron. Forged



tellurium copper alloy tip holds approximately 680 deg. temperature for almost a minute, and reheats in 20 seconds by re-inserting in heater-receptacle. The heater-receptacle and the normal soldering tip are interchangeable. Sound Equipment Corp. of Calif., Glendale.

SMALL SPEED CHANGERS

Available for instruments, controls, and where needed to increase or decrease the speed of small power devices, speed changers have an over-all length of 2 11/16 inches and diameter of 1 1/16 inches. They are made in gear ratios of 15, 10, 9, 8, 7, 6, 5, 4, 3, 2, 3/2, 4/3, 5/4, 6/5, or 10/9, and power may be transmitted in either direction. Speeds



up to 20,000 r.p.m. and torques to 2 lb.-inches may be obtained for some applications. Spur gear construction is used, and all gears are hardened. The two concentric drive shafts are mounted in permanently lubricated ball bearings. The intermediate gears are mounted in

Veeder-Readings

will make for

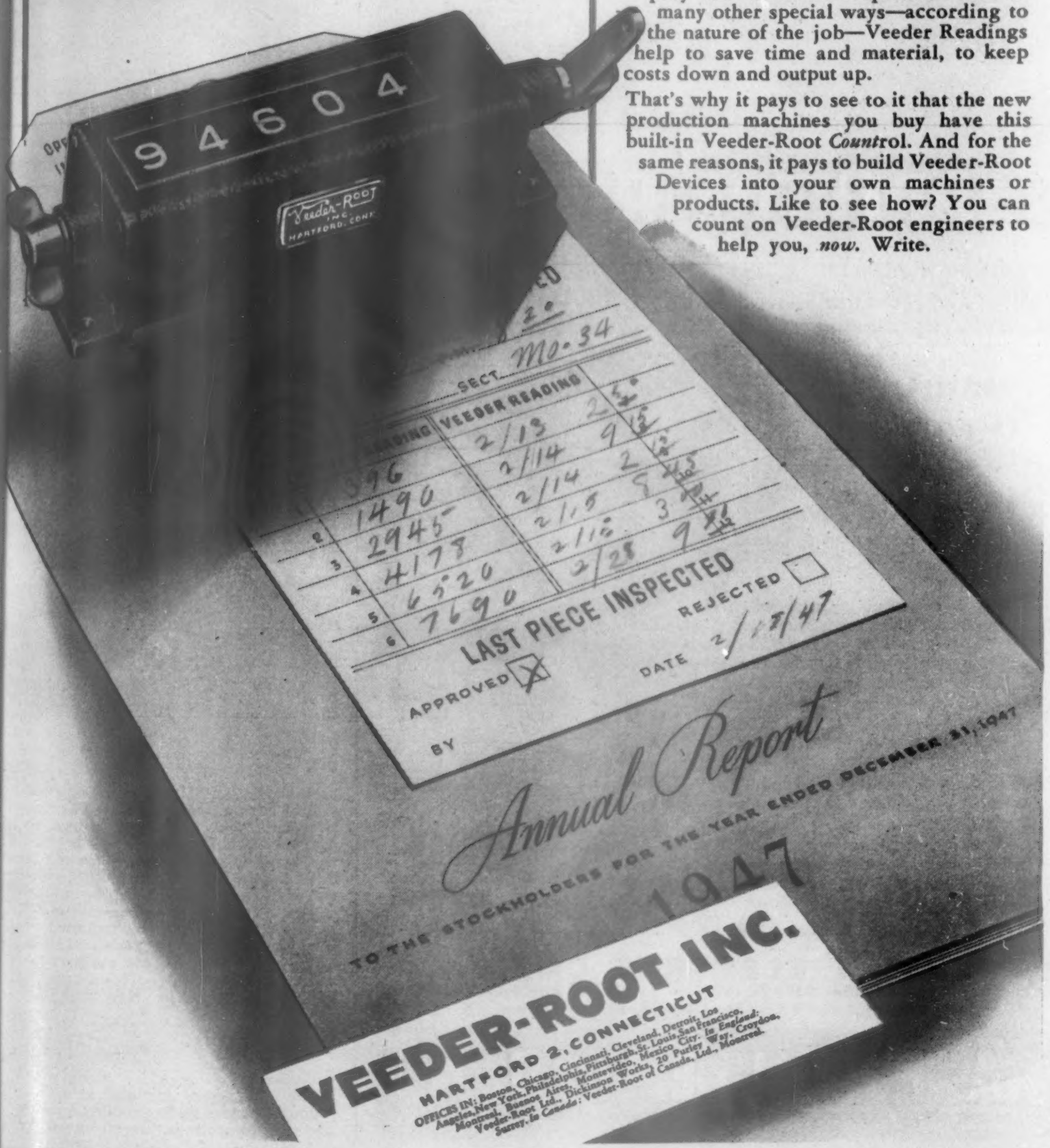
BETTER READING

on your next Annual Report

*VEEDER READING is a standard term used by manufacturers to designate the performance figures which keep turning up on the faces of Veeder-Root Counting Devices built into—or installed on—any type of production machine or process.

These Veeder Readings are *direct* readings. Operators don't have to convert or translate them . . . which means far fewer errors. What's more, these readings indicate any mechanical slowdown, so that it can be corrected immediately . . . before final assembly bogs down, and inter-departmental timing is thrown off. These readings simplify the work of inspectors.* And in many other special ways—according to the nature of the job—Veeder Readings help to save time and material, to keep costs down and output up.

That's why it pays to see to it that the new production machines you buy have this built-in Veeder-Root *Count*rol. And for the same reasons, it pays to build Veeder-Root Devices into your own machines or products. Like to see how? You can count on Veeder-Root engineers to help you, *now*. Write.



Now...

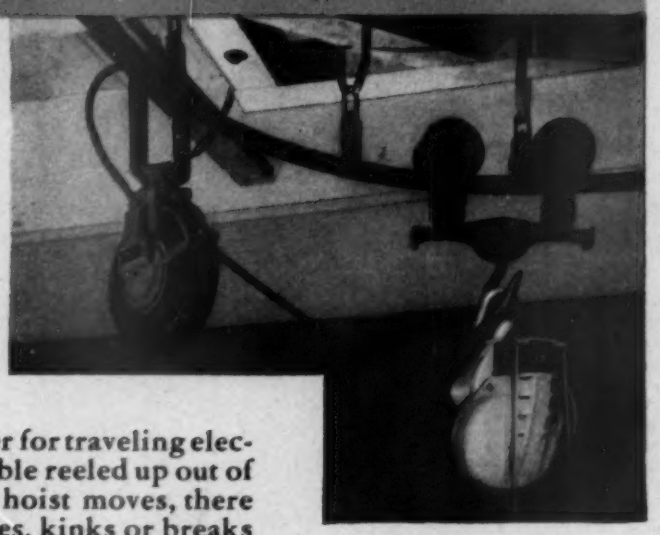
SAFE, SURE POWER FOR TRAVELING HOISTS

New Type "YS"

APPLETON REELITE

TRADE MARK

• AUTOMATICALLY TAKES UP, PAYS OUT CONDUCTOR CABLE...
• NO EXPOSED CURRENT COLLECTORS, TROLLEYS OR WIRES



RATING:
15 AMPERES
550 VOLTS, A.C.
250 VOLTS, D.C.

The perfect working partner for traveling electric hoists! Keeps excess cable reeled up out of the way. No matter where hoist moves, there is no danger of cable tangles, kinks or breaks to endanger personnel or delay production.

Swivel base permits cord to be fed in any direction; serves any stretch of track, straight or with one or more bends.

Thus, a Type "YS" Reelite equipped with 45 feet of cord will permit the hoist to travel up to 90 feet, when the Reelite is mounted at the mid-point.

Outer covers are easily removed for servicing brushes and power spring, or to make solderless line connections direct to terminal block. Oil-less bearings at all points of rotation.

Sold Through Electrical Wholesalers

Send Today!

Write for your free copy of 50-page Bulletin No. 504 which gives complete information on all Reelites—Portable, Constant Duty and special types. Or, see Sweet's File, Page 2a/22.

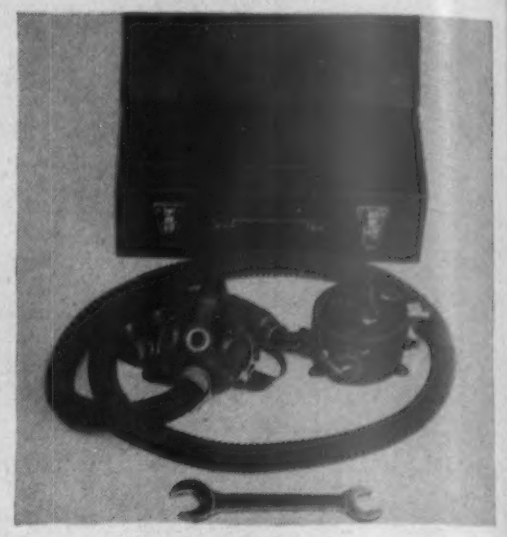
APPLETON ELECTRIC COMPANY
1715 WELLINGTON AVENUE CHICAGO 13, ILLINOIS
14 Branch Offices and 7 Resident Representatives in all Principal Markets

APPLETON
CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

graphitic plastic bearings. A removable foot is provided for platform mounting. Metron Instrument Co., 432 Lincoln St., Denver 9.

OXYGEN THERAPY UNIT

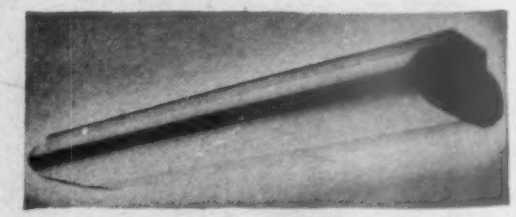
Self-contained and portable (weighing less than 6 pounds), oxygen therapy unit is constructed for treatments by plant physicians in dispensaries, or on emergency calls. Provided with a demand-type oxygen regulator and re-



ducing valve, it supplies a gentle flow of oxygen from any available cylinder through a flexible hose to a flexible facepiece with positive-acting check valves for inhalation and exhalation. An air valve permits mixing outside air with the oxygen if desired. The unit is provided with carrying case, and can also be used with a nebulizer for aerosol treatment with penicillin, streptomycin, and other drugs. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8.

FLUORESCENT LIGHTING

Holoflux is the name of a fluorescent fixture equipped with a Controlens which curves the light downward in an intensive pattern for maximum illumination over the work area. The bending action is said to eliminate glare at normal



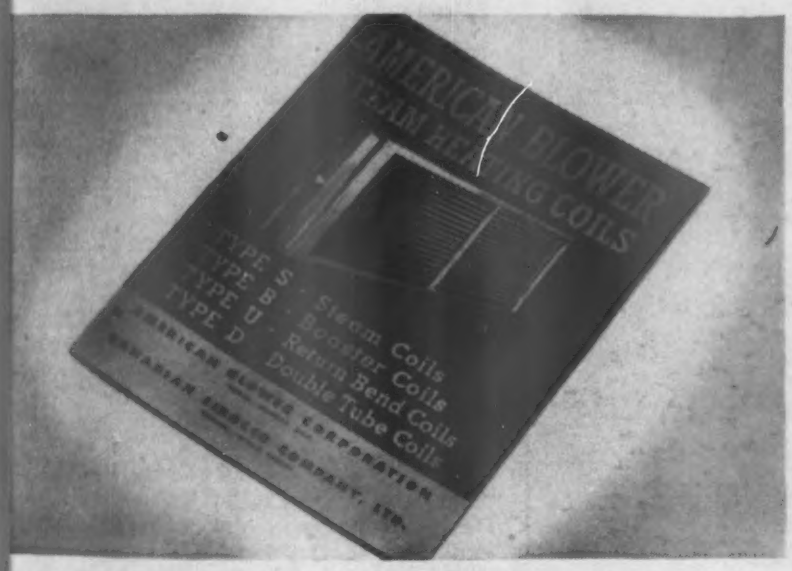
viewing angles. Upper refracting section of the unit spreads some illumination across the ceiling to reduce the contrast of brightness between unit and ceiling. The surface-attached units are 8 3/8 inches deep. Built to take either two or three lamps, they may be installed as single fixtures or end-to-end in extended lengths. May be mounted directly on ceiling, or suspended on stems. Fully enclosed, the fixtures are protected against dirt and dust. Holophane Co., Inc., 342 Madison Ave., New York 17.

DRUM PUMP

Air-operated heavy-duty drum pump handles lubricants and oils, as well as sound deadeners, sealing materials, paints, and other compounds, direct from original

What to do to get the BEST in coils

1 Look into the engineering background of the maker. You'll discover that American Blower is one of the oldest and largest manufacturers of heating and cooling equipment. The present line of American Blower heating and cooling coils is the product of engineering and manufacturing skill that dates from 1881. These new heating and cooling coils follow in every respect the American Blower tradition of constant research, sound engineering, conservative ratings, rigid inspection and competent manufacture.


AMERICAN BLOWER
STEAM HEATING COILS
TYPE S - Steam Coils
TYPE B - Booster Coils
TYPE U - Return Bend Coils
TYPE D - Double Tube Coils

2 After you've taken Step 1, we know you'll send for these two bulletins—complete, convenient, easily understood guides to the selection and use of heating and cooling coils for every industrial need. American Blower engineers have assembled 56 pages of *authoritative* information on heating coils and 48 pages of invaluable cooling coil data. This wealth of information is now available to you in a compact, easy-to-use form. If you have problems in the selection, sizing or installation of coils, you will find these bulletins to be complete handbooks on the subject. Phone or write the nearest American Blower Branch for your copies of Bulletins B-1218 and 1521.

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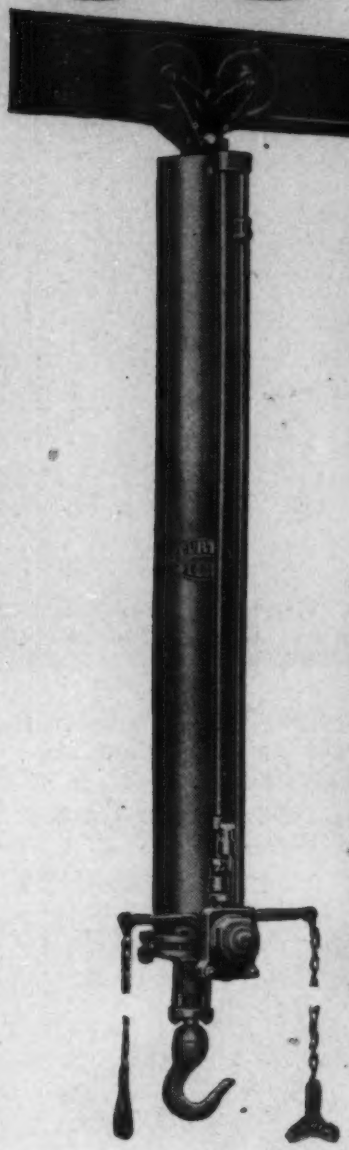
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

SAVE TIME—REDUCE LABOR COSTS
for Lifting, Pushing or Pulling *With*

CURTIS
Air Hoists



Check these advantages:

- √ Low first cost, lowest operating expense
- √ Smooth, fast, accurate control
- √ Finger-tip control
- √ Light weight, immune to overloading
- √ Capacities up to 10 tons

For full information on Curtis Air Hoists, Air Cylinders and Air Compressors, write for Form C-7.

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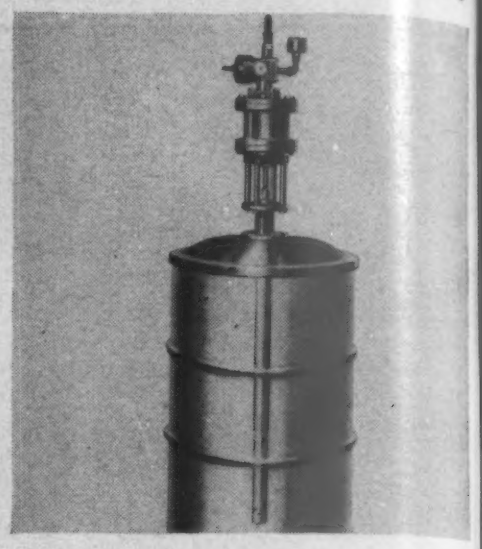
Firm.....
Street.....
City.....*Zone*.....*State*.....

93 Years of Successful Manufacturing

containers of 55-gal. capacity. Eliminates loss and contamination of material in handling. Available in drum cover types for full opening drums, and in bung-



bushing types for mounting in drums equipped with 2-in. bung-hole. Both types are offered in seven pressure ratios, from 40 to 1 to 2 to 1, according to requirement. The Aro Equipment Corp., Bryan, Ohio.

PAVING BREAKER

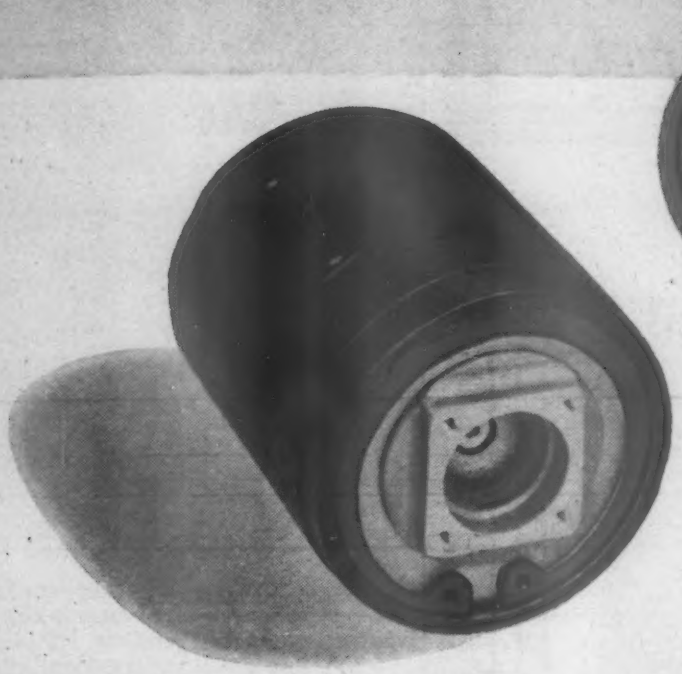
Type PB-8 paving breaker is an 82-lb. machine for heavy-duty demolition work and general paving breaking jobs. Kicker-port valve is said to increase efficiency and striking power. Metering device furnishes required lubrication for all working parts, and tool has a large oil reservoir in handle. Four-bolt

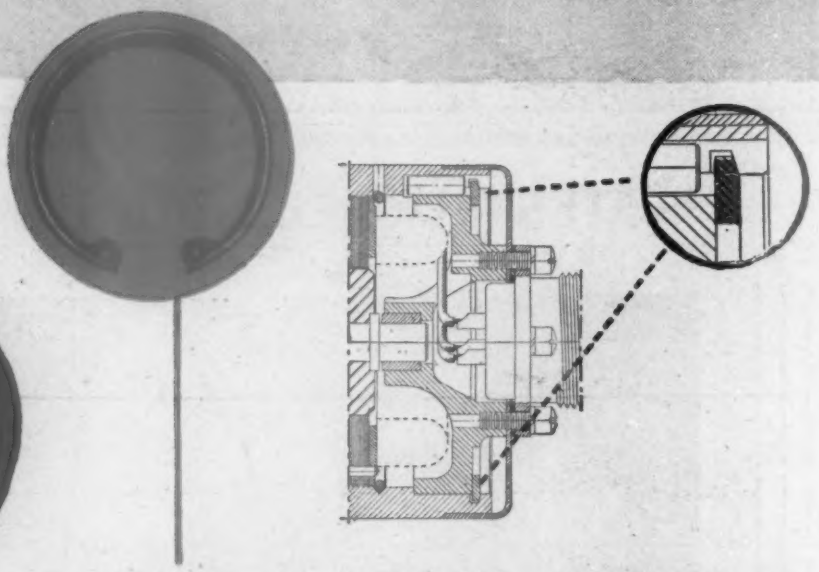
construction provides a rigid joint between the handle and cylinder. Throttle valve allows gradual entrance of air. The tool features a sturdy block-type piston, long anvil-block bearing, and a long handle. May be converted into a pile driver or spike driver by changing front-heads. Ingersoll-Rand Co., 11 Broadway, New York 4

HAND TACHOMETER

Designed to help maintain maximum tool and equipment efficiency, hand tachometer facilitates checking the speeds, clockwise and counter-clock-

Truarc Beveled Ring takes up end-play, eliminates shims, saves 20 minutes' assembly time





TACHOMETER GENERATOR—Kollsman Instrument Division, the Square D Company—showing Waldes Truarc Beveled Retaining Ring.

When installed in a groove with a corresponding bevel, the tapered edge of the Beveled ring acts like a wedge and rigidly bridges end-play. End-play can also be taken up resiliently by another type Truarc ring—the Bowed.

Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins—there's a Truarc ring that does a better job of holding parts together. All Truarc rings are precision engineered, easy to assemble and dis-assemble, always circular to give a never-failing grip. They can be used over and over again.

See what can be done for your product: send a drawing to Waldes Truarc Technical Service Engineers for individual attention without obligation.

One Waldes Truarc Beveled Retaining Ring gives Five big advantages:

Secures the cover with its connecting parts in the housing against strong pressure, heavy vibration

- Absorbs accumulated tolerances up to .010 (ring diameter is 1.9375)
- Eliminates shims, saves material and weight
- Saves 20 minutes' assembly time
- Simplifies field maintenance by facilitating quick dis-assembly, re-assembly

WALDES

TRUARC

Reg. U. S. Pat. Off.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

Canadian Distrib.: Controlite Engineering & Sales Ltd., 20 Bloor Street W., Toronto 5

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Waldes Kohinoor, Inc., 47-10 Austel Place 19-P
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WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,948; 2,026,464; 2,416,852 AND OTHER PATS. PEND.

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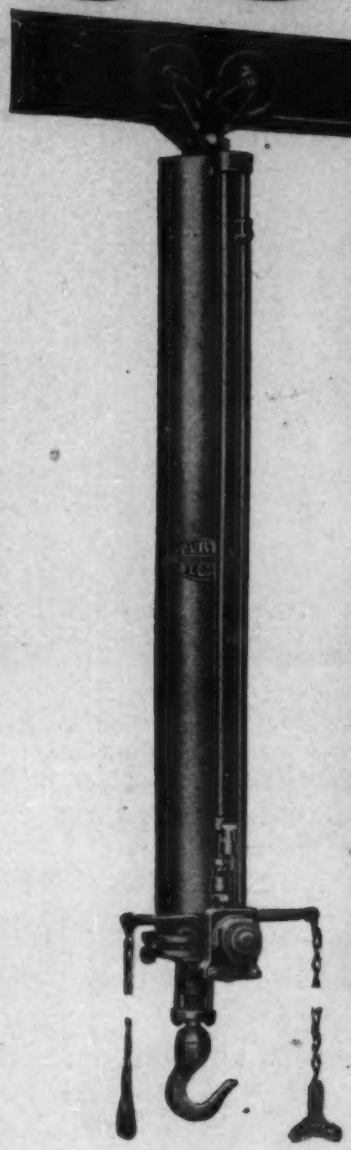
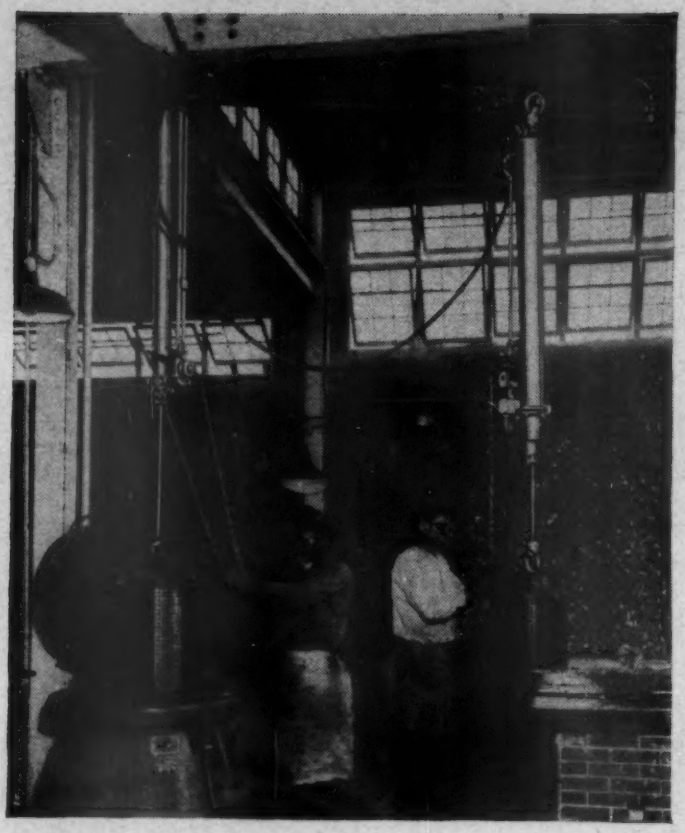
for Lifting, Pushing or Pulling *With*

CURTIS Air Hoists





Check these advantages:

- √ Low first cost, lowest operating expense
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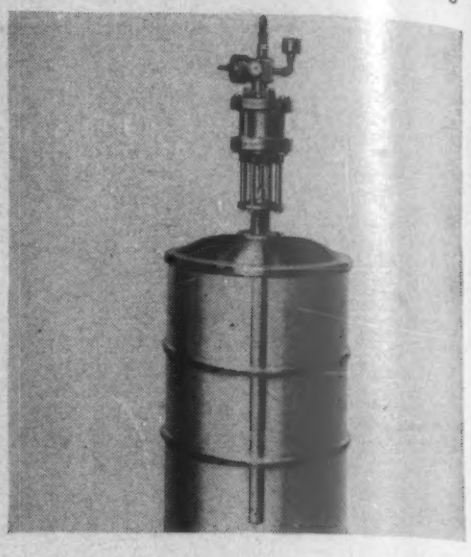
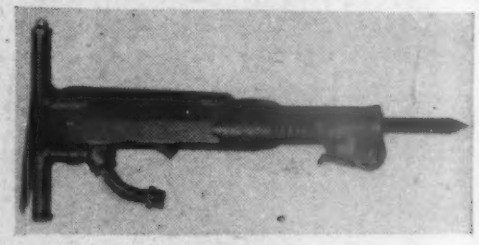
containers of 55-gal. capacity. Eliminates loss and contamination of material in handling. Available in drum cover types for full opening drums, and in bung-



bushing types for mounting in drums equipped with 2-in. bung-hole. Both types are offered in seven pressure ratios, from 40 to 1 to 2 to 1, according to requirement. The Aro Equipment Corp., Bryan, Ohio.

PAVING BREAKER

Type PB-8 paving breaker is an 82-lb. machine for heavy-duty demolition work and general paving breaking jobs. Kicker-port valve is said to increase efficiency and striking power. Metering device furnishes required lubrication for all working parts, and tool has a large oil reservoir in handle. Four-bolt

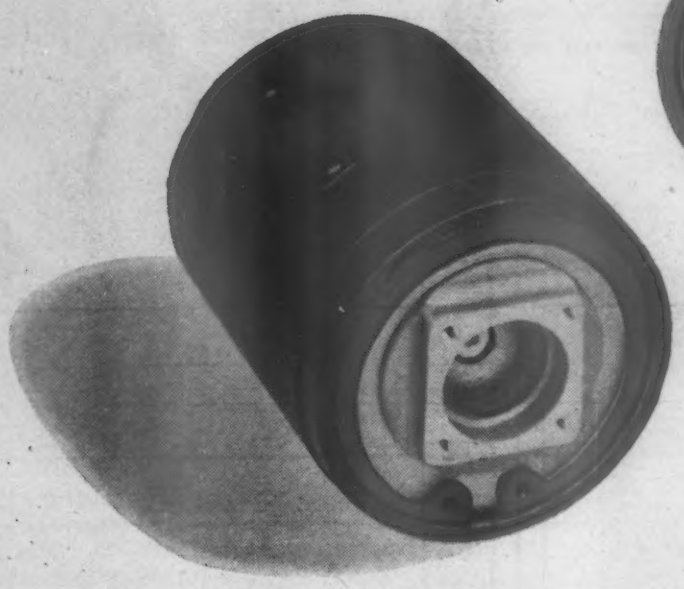


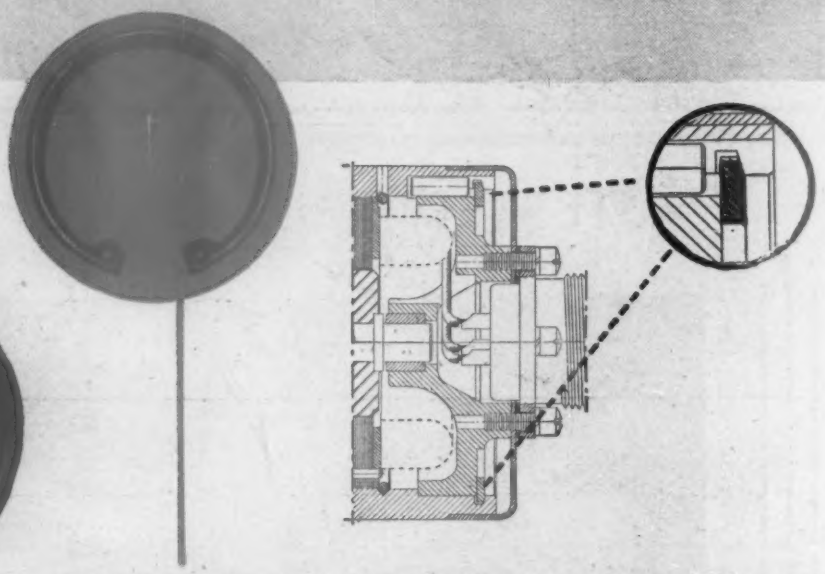
construction provides a rigid joint between the handle and cylinder. Throttle valve allows gradual entrance of air. The tool features a sturdy block-type piston, long anvil-block bearing, and a long handle. May be converted into a pile driver or spike driver by changing front-heads. Ingersoll-Rand Co., 11 Broadway, New York 4

HAND TACHOMETER

Designed to help maintain maximum tool and equipment efficiency, hand tachometer facilitates checking the speeds, clockwise and counter-clock-

Truarc Beveled Ring takes up end-play, eliminates shims, saves 20 minutes' assembly time





TACHOMETER GENERATOR—Kollsman Instrument Division, the Square D Company—showing Waldes Truarc Beveled Retaining Ring.

When installed in a groove with a corresponding bevel, the tapered edge of the Beveled ring acts like a wedge and rigidly bridges end-play. End-play can also be taken up resiliently by another type Truarc ring—the Bowed.

Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins—there's a Truarc ring that does a better job of holding parts together. All Truarc rings are precision engineered, easy to assemble and dis-assemble, always circular to give a never-failing grip. They can be used over and over again.

See what can be done for your product: send a drawing to Waldes Truarc Technical Service Engineers for individual attention without obligation.

One Waldes Truarc Beveled Retaining Ring gives Five big advantages:

- Secures the cover with its connecting parts in the housing against strong pressure, heavy vibration
- Absorbs accumulated tolerances up to .010 (ring diameter is 1.9375)
- Eliminates shims, saves material and weight
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TESTED RELIABILITY

From the production of sulphuric acid to building large machines—Tannate-Rockwood units have helped manufacturers keep their drives running smoothly at top capacity. Engineered to automatically maintain proper tension, Tannate-Rockwood installations help keep production up and costs down. Adaptable for a wide range of motor sizes from fractional HP to over 400 HP, Tannate-Rockwood units are easy to install and require little maintenance while in service.

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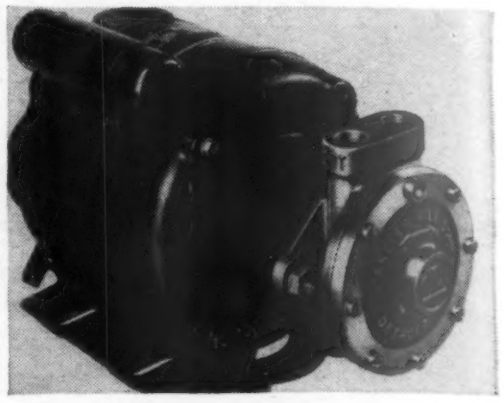
wise, of motors, drill presses, shafts, and other machines. Size permits operator to hold it in his palm when making tests. Chrome plating protects the tachometer from corrosion or rust. Equipped with two interchangeable rubber tips, one for recessed shafts and pulleys, the other for flat surfaces. AC Spark Plug Div., General Motors Corp., 1941 McGinnis St., Flint, Mich.

PUMP

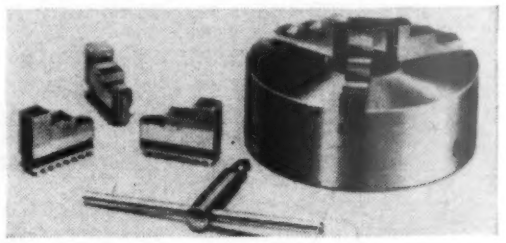
Liquids in the medium flow and pressure field are handled by Model 4702 pump built for quiet, service-free life. Pumping mechanism components are made



from corrosion-resisting materials to suit type of liquid pumped. The rotating impeller is designed to "float hydraulically" in the housing, to minimize loss of flow or discharge pressure. Pump permits flow of liquid when it is not operating, without need for bypass or relief valve arrangement. Mechanical face type shaft seal separates the pumping chamber from a permanently lubricated ball bearing. Candler-Hill Corp., Div. Titan Pump & Eng. Corp., 405 Midland Ave., Detroit 3.

LATHE CHUCK

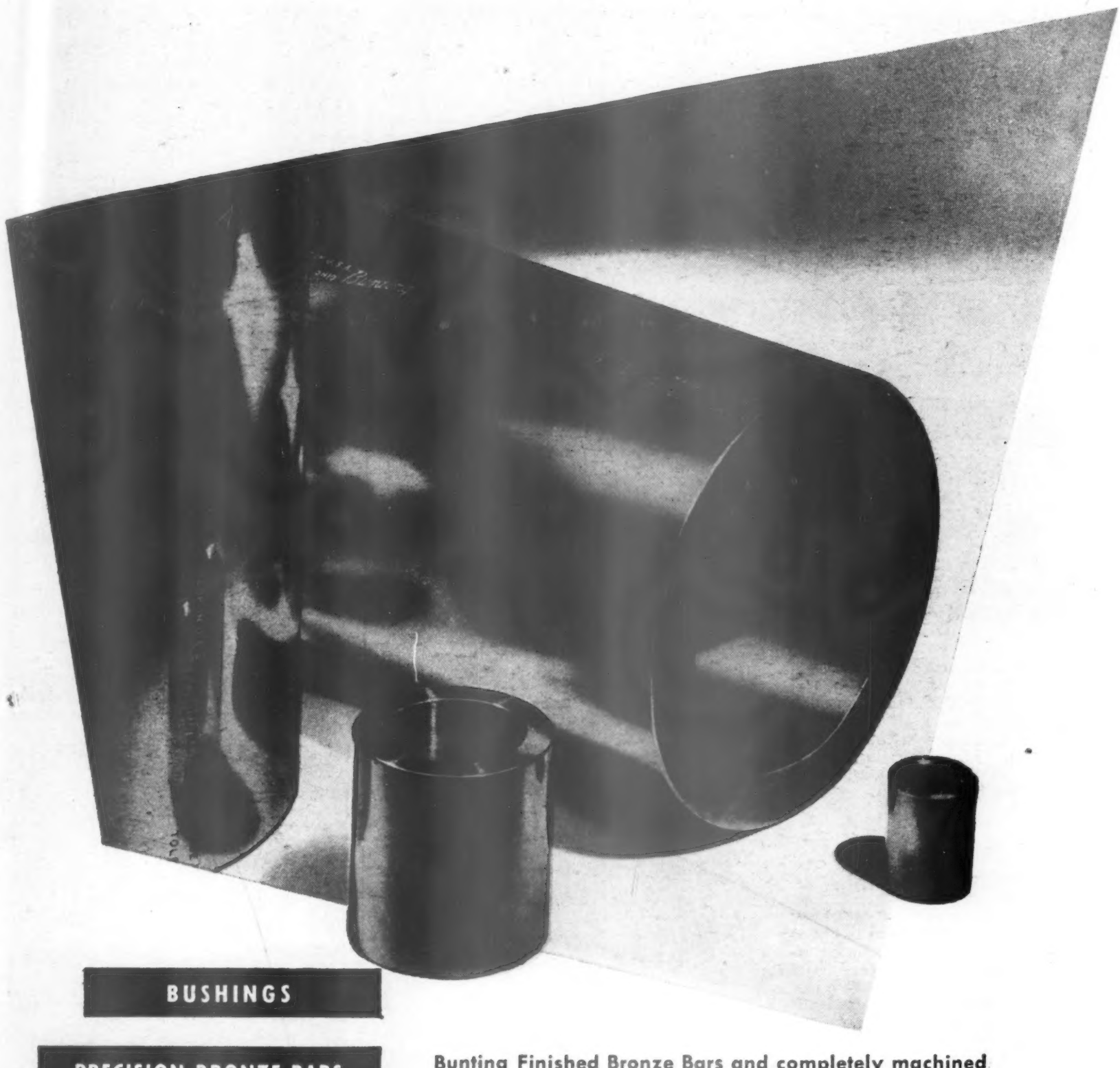
Five-inch universal lathe chuck is provided with three hardened alloy pinions, to reduce wear and eliminate search time. Two sets of interchangeable jaws, for internal and external grip, are made



of hardened alloy steel Semi-steel is used for body of chuck, and the scroll is of alloy steel. A 6-in. independent 4-jaw chuck for 1½-in. - 8 spindle thread mounting is available. Falls Products, Inc., 104 North Genoa St., Genoa, Ill.

PIPE CLAMPS

Claimed to withstand pressures to 1100 p.s.i. on corroded pipe without leaking, stainless steel clamps are designed for permanent repair of oil, gas, aromatic fuel, water, and similar pipe leaks. They weigh up to 6 pounds, and can be installed by one man. Equipped with laminated Hycar rubber pads which compress into corroded area of pipe when under pressure, while resisting the ten-



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Econostat

The ECONOSTAT is applicable to all types of heating systems in factories, and in commercial, industrial, and office buildings.

Installation is simple, requiring only the cycling control unit shown here and a motor-operated valve on the principal main or a switch on the burner. For zoned system, a separate installation is usually used on each zone.

IMPROVES HEATING ECONOMY

This efficient, durable, and highly flexible instrument is designed to control the operation of a motor driven valve (with central steam plant heat supply) or an oil or gas burner or stoker (where the building has its own heating system) so as to regulate the heating of a building in accordance with changes in outdoor temperature by supplying heat at intervals. It will avoid overheating and maintain more uniform temperature — thus achieving maximum fuel savings. Simple adjustments cover length of cycle, operating range, calibration, night temperature depression, and morning warm-up to suit individual building conditions.

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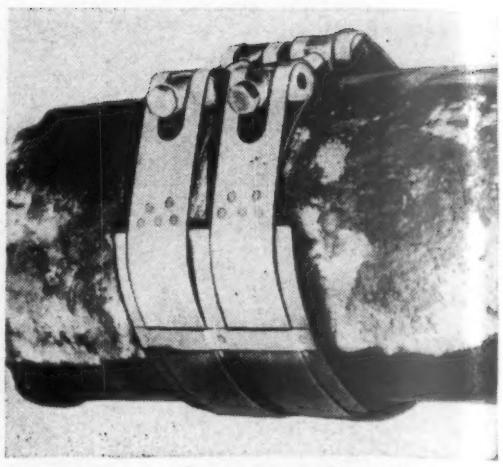
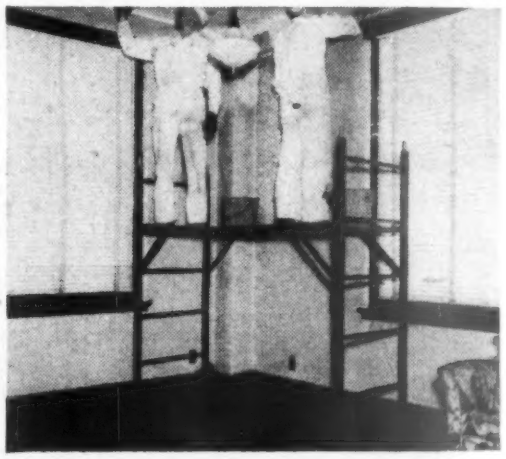


dency to cold flow; and a stainless steel patch plate which slides on clamp band. The clamps fit all sizes of pipe from 2 to 8 inches. Larger sizes may be obtained if desired. Marman Products Co., Inc., 940 West Redondo Blvd., Inglewood, Calif.

PORTABLE SCAFFOLDS

Built for "off-the-floor" jobs, scaffold can be wheeled by one man through ordinary doorways, and carried on standard elevators without dismantling. Elimination of X-braces permits moving it over and around equipment. Each leg of the scaffold has a ball-bearing, swivel-type caster with hard rubber wheel. A single unit of the scaffold is 6 feet high, 6 feet long, and 29 inches wide. It can be adjusted to keep the platform level on



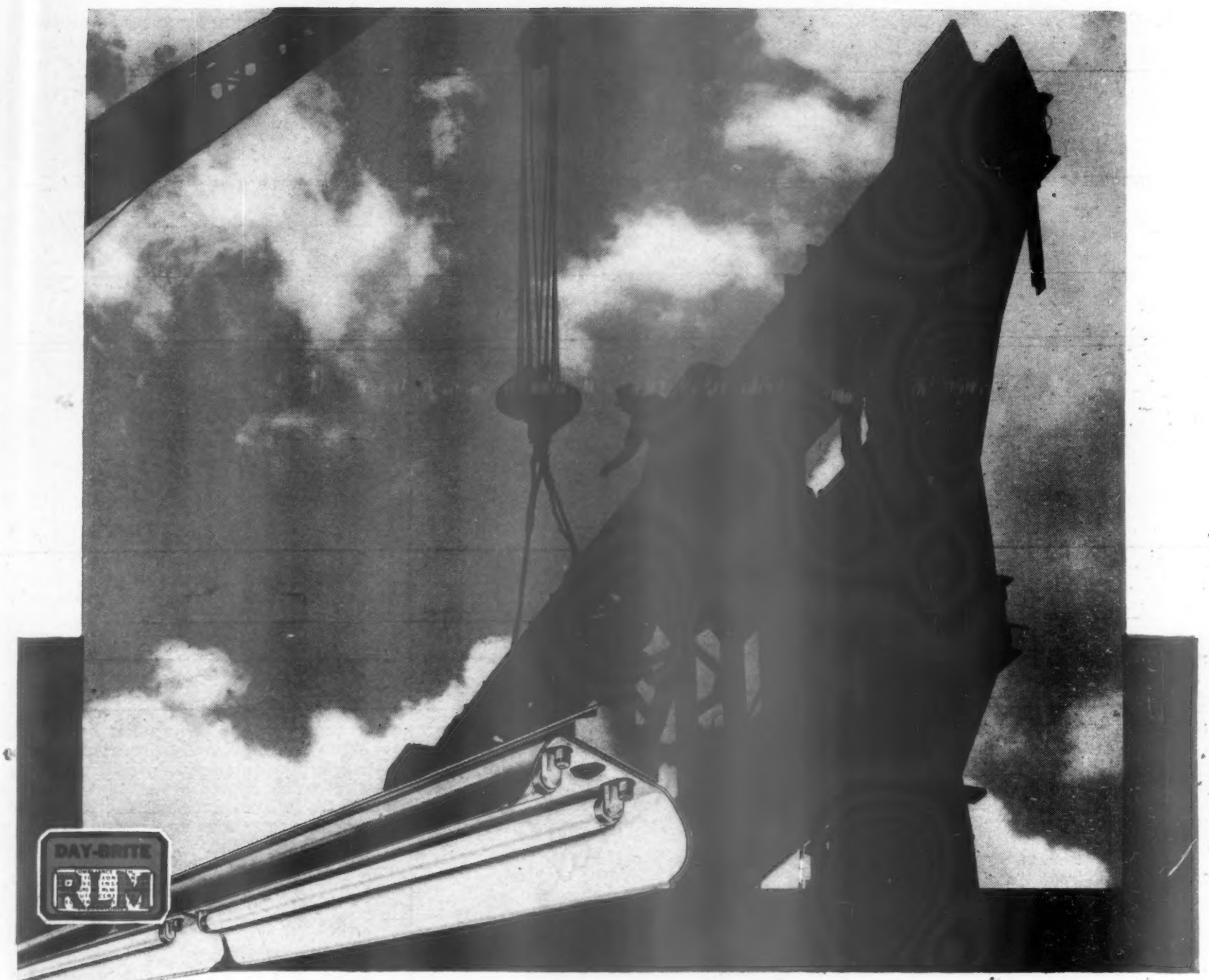
uneven surfaces. The units can be stacked for added height, or to cover any floor area. Baker-Roos, Inc., 602 West McCarty St., Indianapolis, Ind.

ALUMINUM-WHEELED CASTER

Caster is made with wheels of aluminum alloy of high tensile strength. The self-lubricating wheel is suitable for use in plants where explosive hazards exist. Face of wheel is machined concentric with the axle, and runs on roller bearings equipped with hardened inner races, furnished with high-pressure Zerk fittings. The casters are available in swivel and rigid types, equipped with 4x2, 6x2, and 8x2-in. aluminum alloy wheels. The Market Forge Co., Everett 49, Mass.

PLUG GATE VALVES

Line of corrosion-resistant plug gate valves, providing straight-through flow in the open position, is suitable for throttling service. The valve is not sub-



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The DAY-LINE

Heavy duty industrial fluorescent fixture with porcelain-enameled steel reflectors. Designed for two and three 40- or two 100-watt lamps—unit or continuous installations. U. S. Patent Nos. 2317434, D-135375 and D-133458.

Day-Brite Lighting, Inc., 5441 Bulwer Avenue, St. Louis 7, Mo.
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In Canada: address all inquiries to Amalgamated Electric Corp., Ltd., Toronto 6, Ont.

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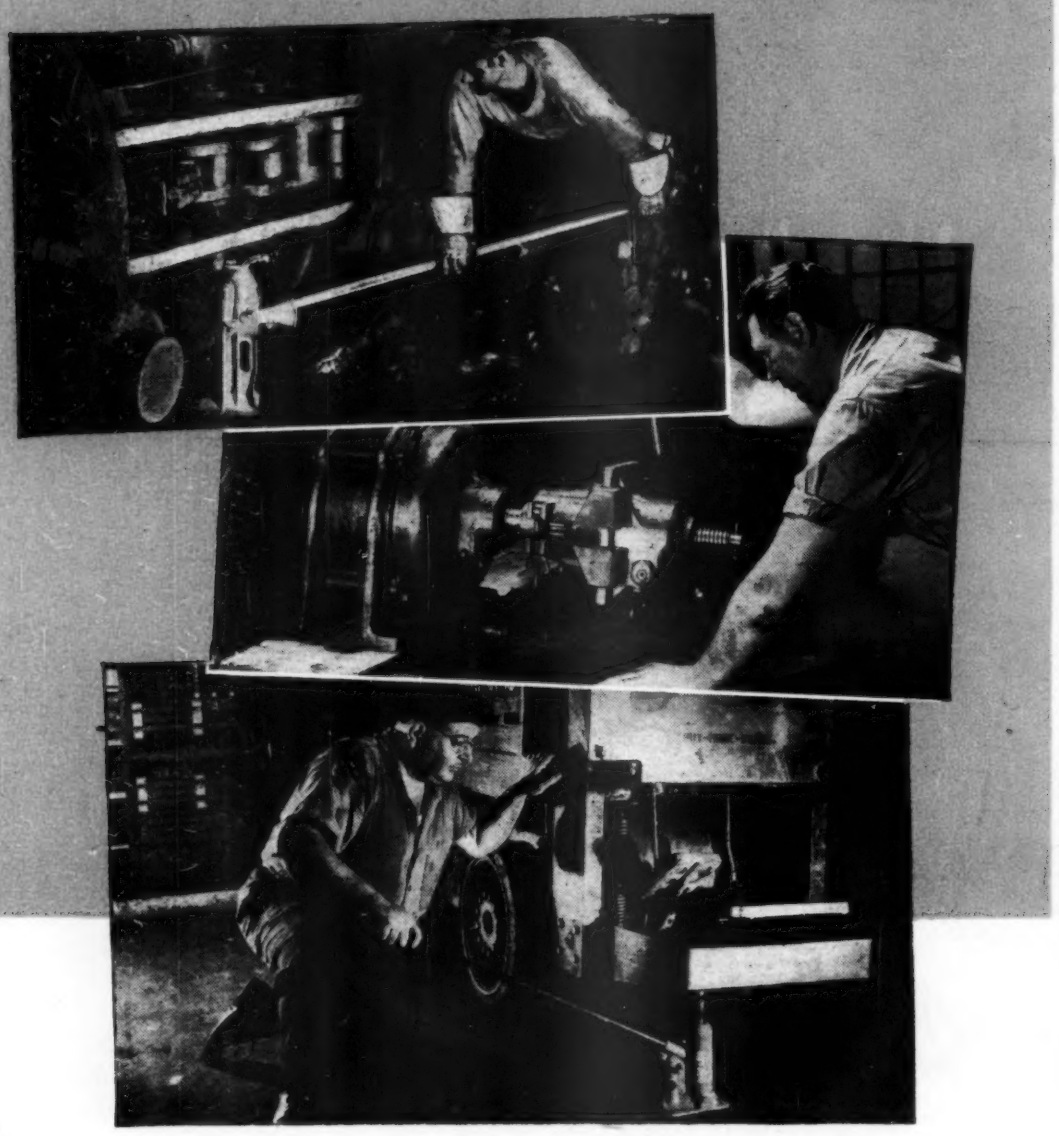

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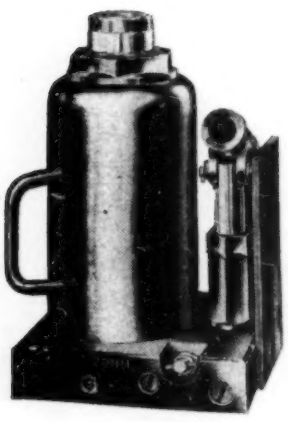
mean economy of Time, Labor and Costs



Lifting, lowering, pushing or pulling heavy machinery and other heavy loads is easy and economical—if you have the *right* jack for the job.

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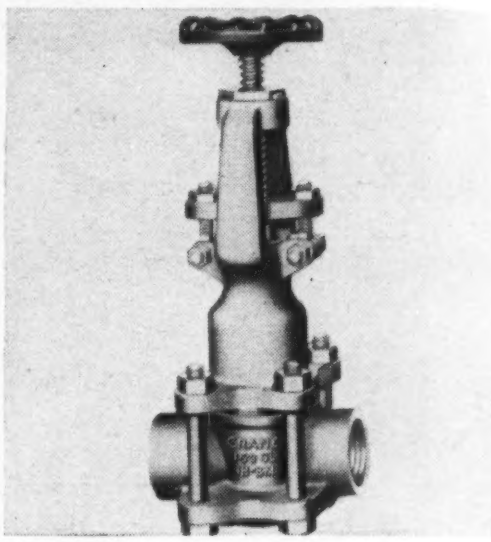
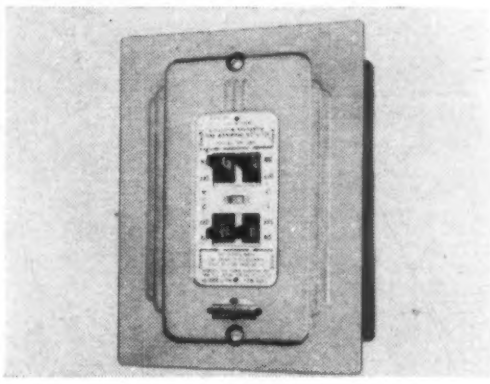
ject to sticking in the closed position, even though it is closed while hot and opened when cold, and there is no



tendency to galling, maker states. Of outside-screw-and-yoke design, the plug gate valves have bolted bonnet joints and are available with either screwed or flanged ends in sizes from ½ to 2 inches. Crane Co., 836 South Michigan Ave., Chicago 5.

SMALL MULTI-BREAKER

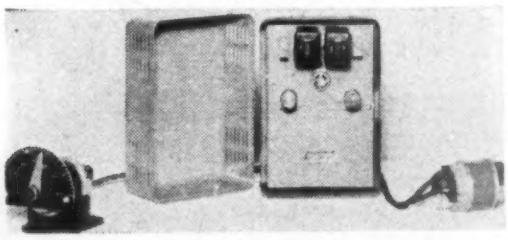
Small Mo-4 multi-breaker combines four breaker poles which can be used as four single-pole circuits or can be converted to one or two double-pole, 3-wire solid neutral circuits by inserting a tie rod. Incorporates thermal overload protection and additional



magnetic protection against heavy short circuits. Carries a 50-amp. maximum solid main rating, with individual single poles rated at 15, 20, or 30 amperes. Cutler-Hammer, Inc., 253 North 12th St., Milwaukee 1.

POSITIONING CONTROL

Electronic positioning control system is designed for controlling inaccessible dampers from control stations on the floor, for positioning heavy work in ma-



chine tools, and for opening, closing, and adjusting to intermediate points valves and gates from a single coordinated control desk. The system has three parts—a master control station and a follow-up

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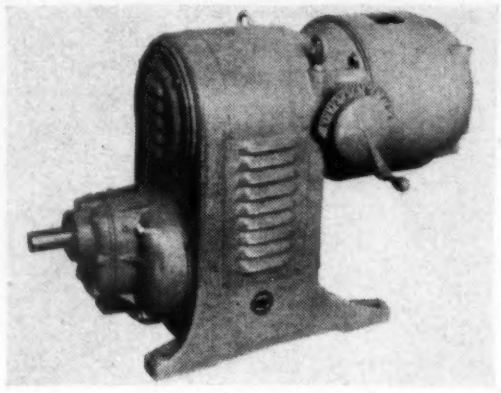
device (which can be either small selsyns or potentiometers), and an electronic control panel. Any reversing a.c. or d.c. motor that can handle the load may be used. Master control station is connected to the panel by three leads. The system can be used on drives up to 1½ horsepower, and higher in some applications. Control Div., General Electric Co., Schenectady.

VARIABLE SPEED DRIVE

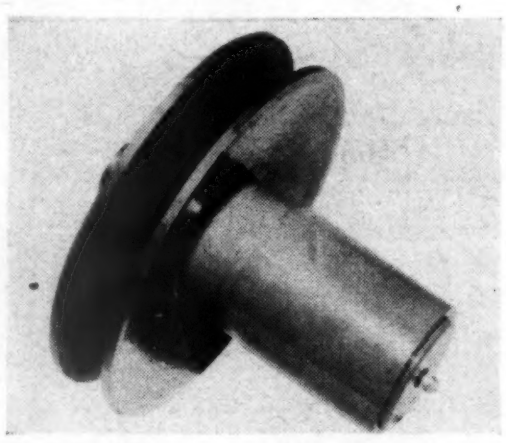
Features claimed for variable speed drive, designated Size 23 Varidrive Motor, are smaller size for a given horsepower, long belt life, convenient positioning of the speed adjusting handwheel, and provision for easy change of Varibelts. Assemblies are available for requirements of horizontal frame with shaft left or right, upright frame with



shaft high or low, and built-in speed reducers of single or double reduction. Speed variations of 2:1 to 7:1 are obtainable with up to 5-hp. output. U. S. Electrical Motors, Inc., Milford, Conn.

VARIABLE PITCH PULLEYS

Suitable for vertical as well as horizontal shaft mountings, variable pitch pulleys maintain a constant centerline and allow use with a V-groove companion sheave. The pulleys are adaptable to standard constant speed motors of ⅓ to 2 horsepower at 1750 r.p.m., giving variable speeds in a 3:1 ratio. According to the

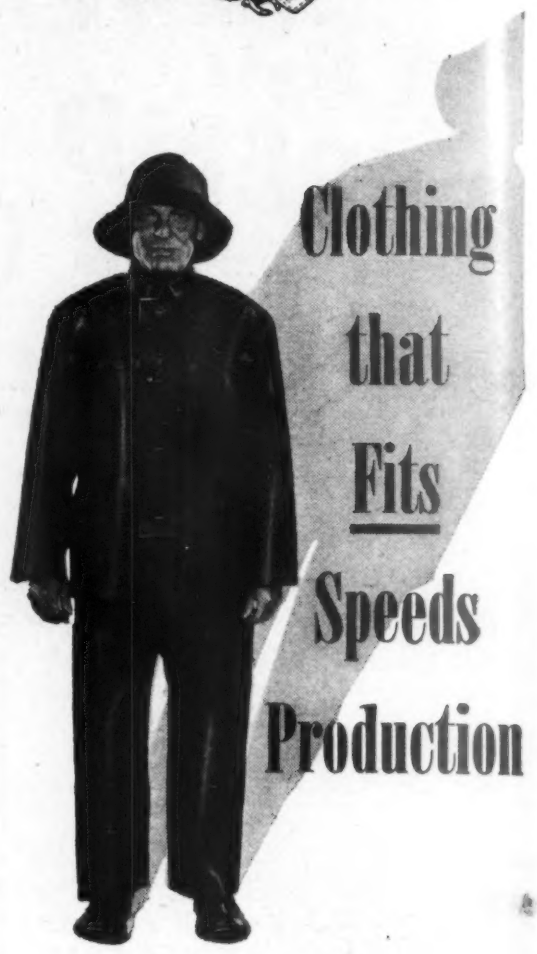


manufacturers, the maximum key area in the design results in longer equipment life and quiet operation. Motor bases and belts are supplied. Gerbing Mfg. Corp., 154 East Erie St., Chicago 11.

FLOOR MARKER

Aisles, traffic borders, storage spaces, danger zones, and other areas can be indicated with lines marked by a portable unit. It can locate lines within 1½ inches

TAILORED FOR THE MAN ON THE JOB



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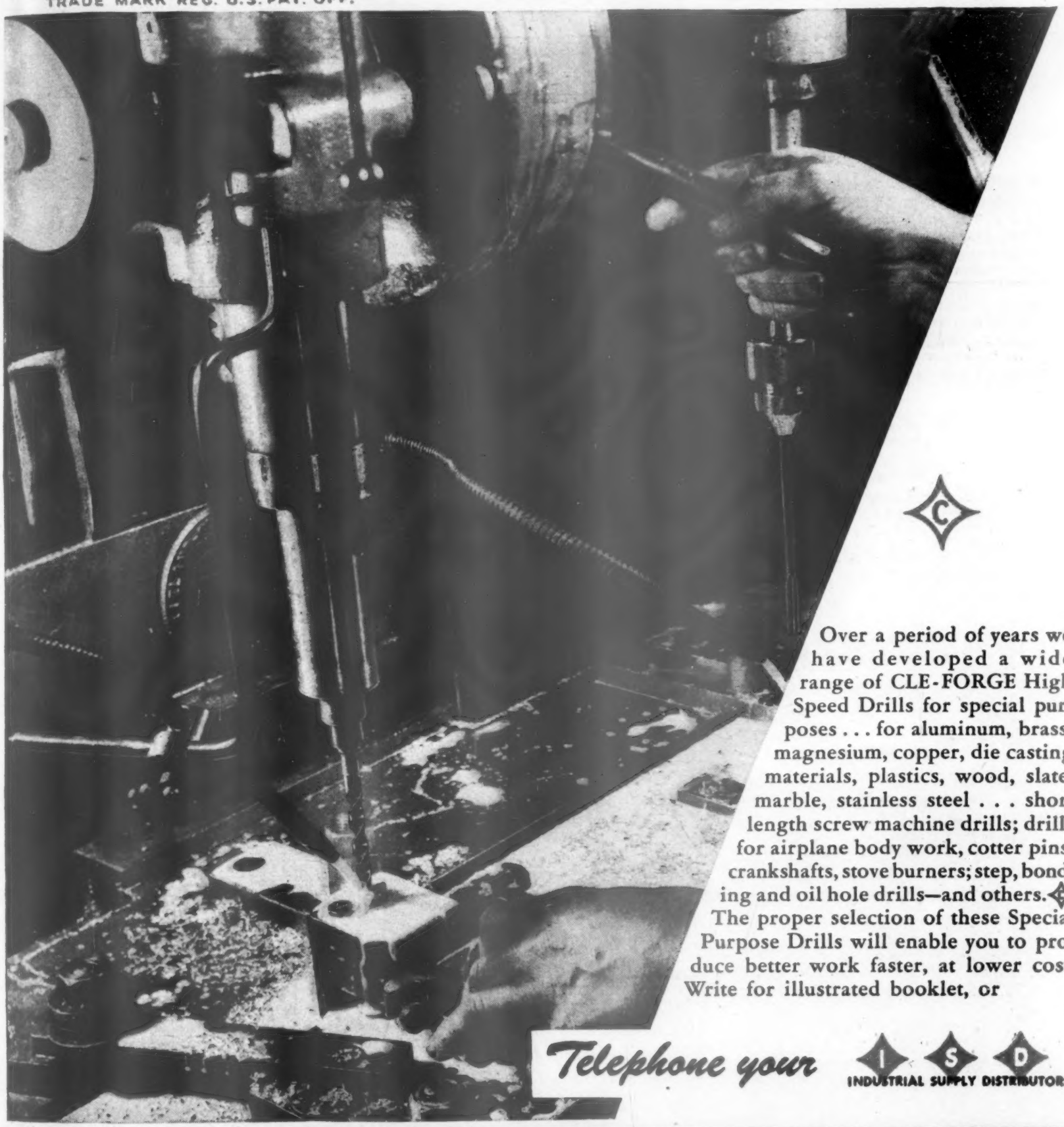

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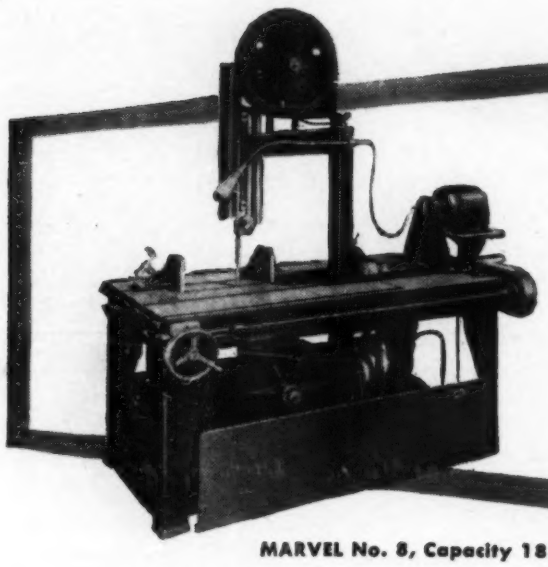

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MARVEL No. 8, Capacity 18" x 18"

There is no other sawing machine like it. The work remains stationary. The blade is guided with a 90° twist and power fed vertically through the work. The saw blade and column can be instantly swung and clamped at any angle to 45° either right or left from vertical for miter cutting.

The number 8 MARVEL saw will handle the smallest, as well as the largest work up to 18" x 18". It will cut-off, trim, miter, notch, and split all bar stock, pipe, structural sections, moulding, tubing, or irregular shapes.

Write for our catalog, containing valuable information, enabling you to select a metal saw best suited to your work.

Metal Cutting MARVEL SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

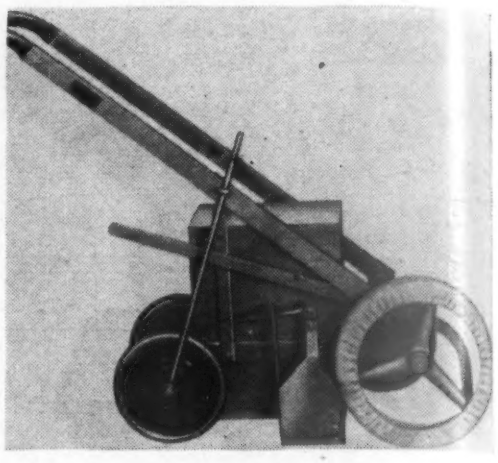
5700 Bloomingdale Ave. Chicago 39, U.S.A.

"He said he'd turn the office upside down to get a seat near the General Electric Water Cooler."

For a lot more smiles from your employees, install General Electric Water Coolers. They cost only 2¢ a day to operate in the average office. You'll get full information from your General Electric Dealer. Call today. *General Electric Company, Air Conditioning Department, Section 7726 Bloomfield, N. J.*

GENERAL ELECTRIC

Water Coolers



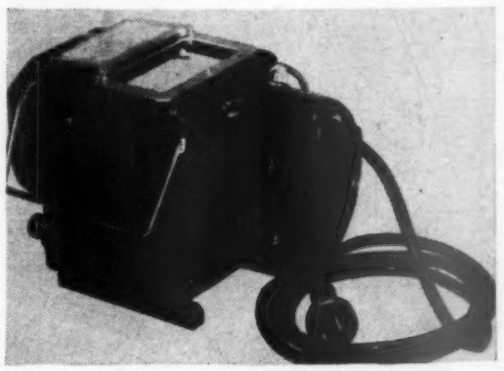
of walls, cases, machines, and material stacks, and can be used outdoors as well as inside the plant. The marking unit has no spray nozzles, pumps, or hose to service. Paint applicator wheel rolls the paint on the surface to be marked. The amount of paint distributed on marking wheel is governed by a thumb nut. Any kind of paint may be applied. Line is 2½ inches wide. Newaygo Engineering Co., Newaygo, Mich.

CONCRETE COATING

Protective coating, called Carbo Floor Coat, for concrete walls and flooring, seals surface pores and prevents absorption and attack from mild acid and alkali solutions, oils and detergents, and water. Also can be used for wood flooring. It will not "bridge" or form a hard lacquer-like slippery film over the surface, maker says. Applied by brushing down or by push broom. Two coatings are necessary. Drying time is 3 to 4 hours. Carbozite Protective Coatings, Inc., Greensburg, Pa.

INSULATION TESTER

Rectifier-operated "Megger" insulation tester can be plugged in a 115-volt a.c. circuit. Suitable for use where a large number of tests are to be made at one



time, and also where an individual test is continued for many minutes, including dielectric absorption tests of insulation resistance made over a period of ten or more minutes. The power pack consists of a constant-potential step-up transformer and selenium rectifier giving a constant d.c. test voltage. The ohmmeter is independent of the applied voltage. Ratings are available up to 2000 megohms and 1000 volts. James G. Biddle Co., 1316 Arch St., Philadelphia 7.

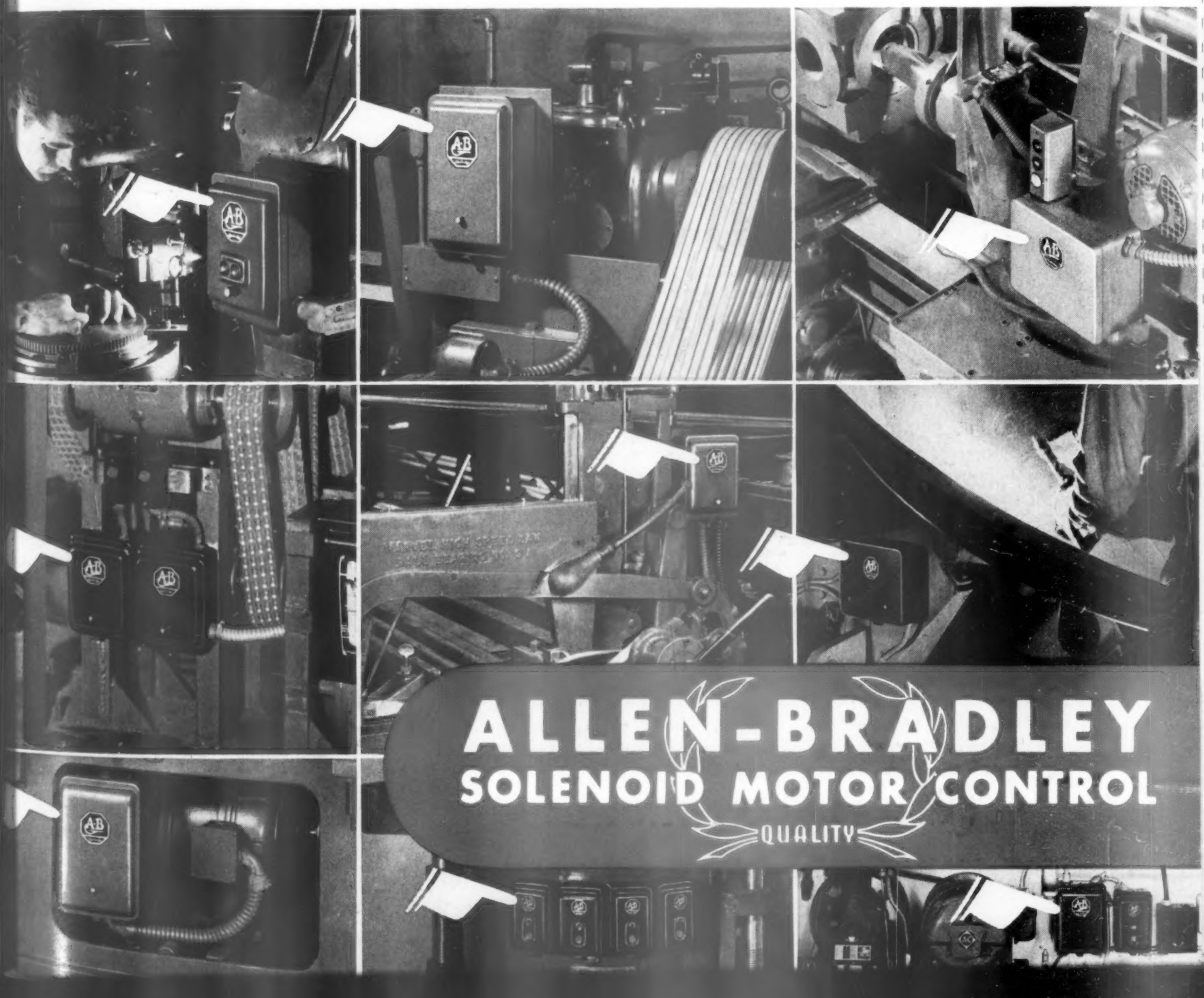
VACUUM CLEANER-BLOWER

Motor-fan unit of vacuum cleaner can be removed to convert the unit into a portable blower. Emits a blast of clean,

A-B Quality

This Nameplate on Your Machines

...a sure sign of QUALITY motor control



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

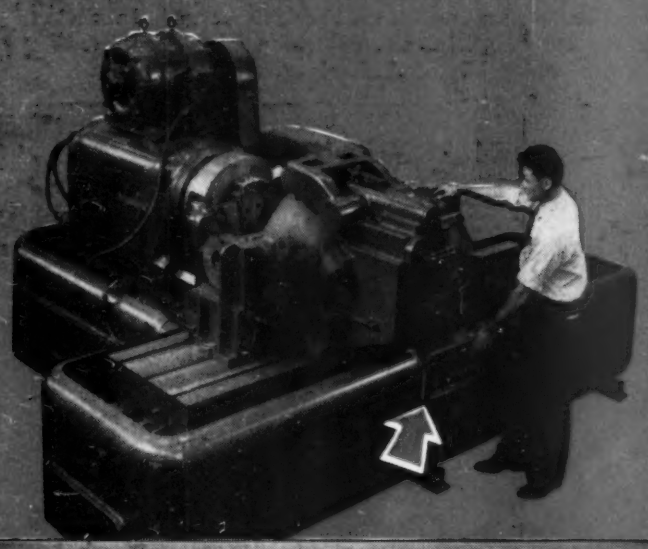
SPECIAL CONTROL PANELS

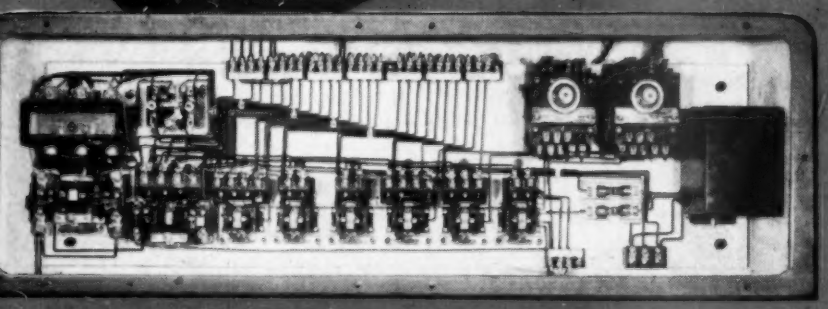
assembled from standard A-B units

to fit your machines

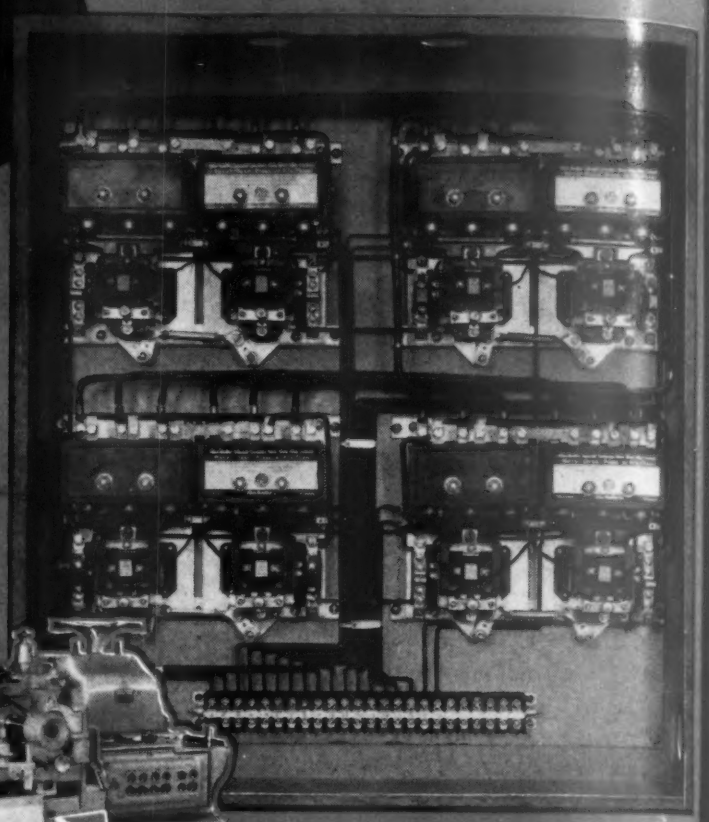
Machine tool builders are concentrating their electric switching units more and more on single control panels . . . using various combinations of standard Allen-Bradley solenoid switches and relays to meet their special operating needs.

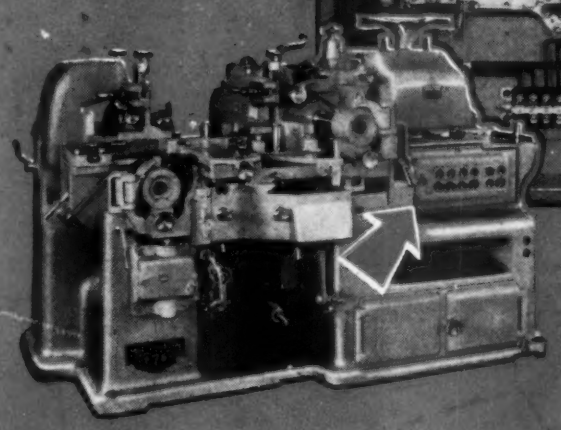
Allen-Bradley control engineers are available to machinery builders for control engineering counsel. They will gladly co-operate with you in developing special panels to satisfy the operating requirements of your machine.





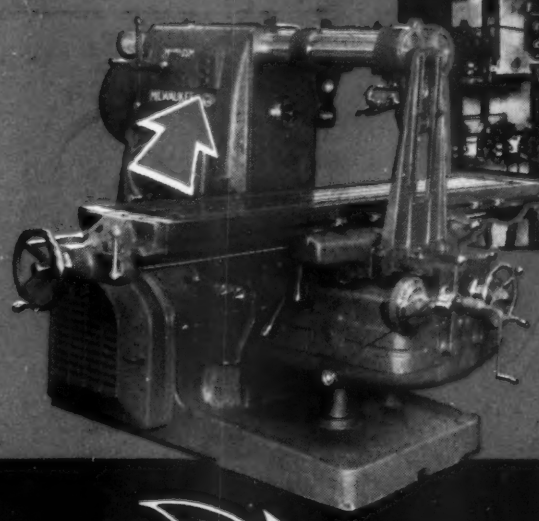
CROSS COMPANY axle housing boring machine panel using various types and sizes of Allen-Bradley contactors and relays. Remote control from push button panel near the operator.





MATTISON moulder panel with mechanically interlocked contactors for dual frequency speed control.

KEARNEY & TRAECKER milling machine panel for controlling 50 hp motor and other units of this carbide steel milling machine. Push buttons are mounted upon the milling machine. The panel is mounted separately in a steel cabinet.



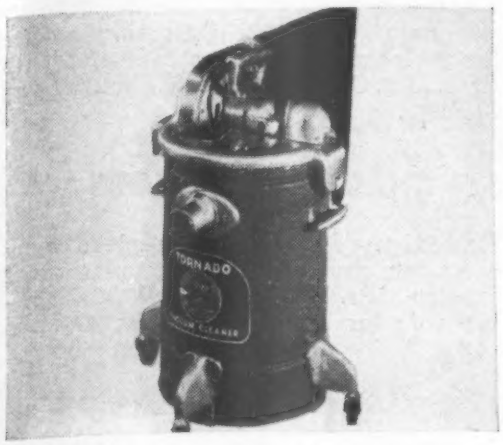
Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

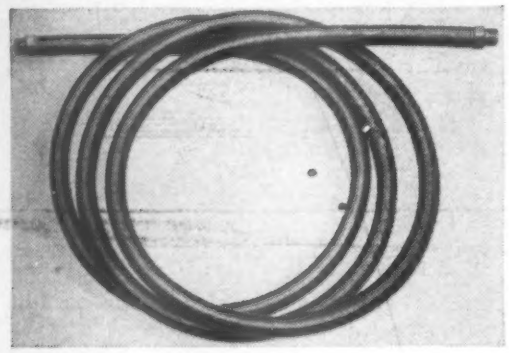
dry air to remove dust, dirt, and fuzz from motors, generators, shafting, and similar equipment. Keeps stock shelves and bins dry and clean, and removes debris from under machines. Returned to



original position, the vacuum cleaner can be used for suction cleaning. Air is exhausted through a bag outside the tank, keeping the suction uniformly high. Lighter dust goes into the bag, and heavy dirt and metal particles are drawn into the 12-gal. steel tank. The unit weighs 40 pounds, and can be wheeled where needed in the plant. Breuer Electric Mfg. Co., 5100F North Ravenswood Ave., Chicago 40.

HIGH FREQUENCY CONDUCTOR

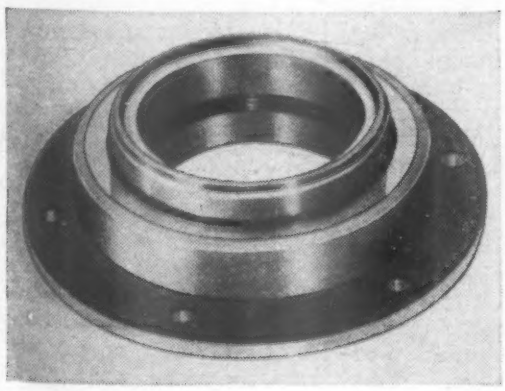
Water-cooled flexible conductor for transmission of high power, high frequency current consists of a brass,

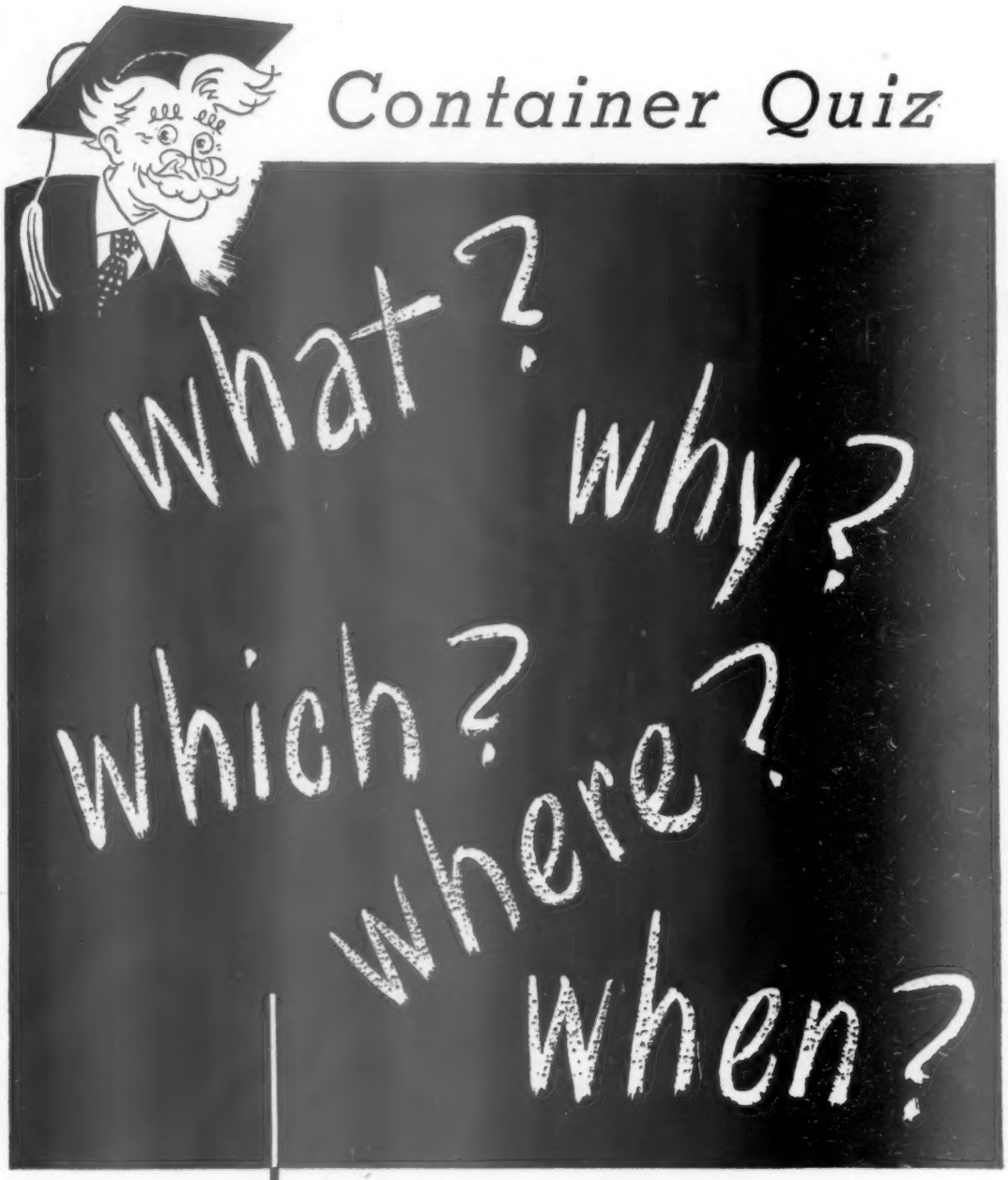


water-tight convoluted inner core with an outer braid conductor. A high frequency flexible insulation is extruded over the outer braid. The conductor is adaptable to high frequency heating and other equipment. Titeflex, Inc., 505 Frelinghuysen Ave., Newark 5, N. J.

OIL SEALING RING

High-speed carbon ring oilseal is suitable for sealing applications where oil lubrication is minimum, where the seal runs in a liquid other than grease or oil, or where shaft speed is high. Rings have a low coefficient of friction, and are



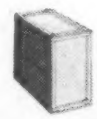


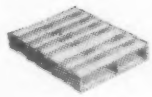
General All-Bound Box

General Nailed Box

General Corrugated Box

General Wirebound Crate


General Cleated Corrugated Container


Generalift Pallet

25 years' experience in designing better containers for all industry.

• The answers to these 5 questions are of vital interest to all those concerned with the better packing of their products.

"*WHAT* container will provide better protection, will best ship our products?" We think that General Boxes will provide better and more economical protection for your products.

"*WHY*?" Because they're designed specifically to the product, as a "Part of the Product."

"*WHICH* type of container will do the most efficient job?" The answer to this important question is provided by our Engineering Service.

"*WHERE* is this service available?" For complete information just write our nearest office.

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1922·1947

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DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon, Natchez.
Continental Box Company, Inc.: Houston, Dallas.

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● The principal markets of today and tomorrow will go to the best-equipped, most efficient producers. Will your plant be among these leaders?

Modern equipment, the key to this new, highly competitive era, includes more than efficient machinery . . . it takes in every corner of your plant.

Consider valves, for example. Good valves are necessary for operating efficiency. LUNKENHEIMER VALVES meet every requirement, for dependable service. Proved through the years . . . in every industry . . . under the most exacting conditions, they deliver longer service at lower maintenance cost. Industrial users trust LUNKENHEIMER VALVES—know they combine carefully selected materials, advanced design and superior workmanship, backed by 85 years of valve manufacturing experience.

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Fig. 16
"Renewo Globe"

Fig. 2125
Bronze Gate

And, backing up this high quality... insuring utmost satisfaction, is a nation-wide service organization. The next time you have a valve problem ... installation, maintenance, repair or operation . . . call your Lunkenheimer Distributor. You'll find his service, like that of LUNKENHEIMER VALVES, truly dependable—always.

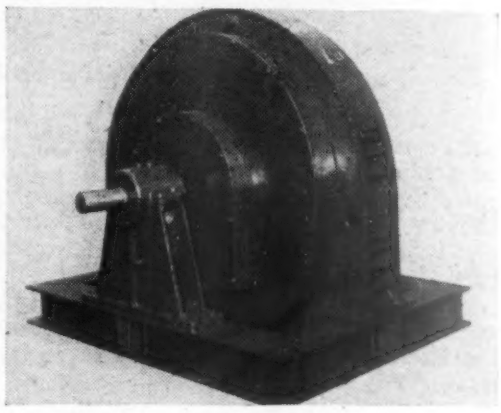
LUNKENHEIMER VALVES

BRONZE, IRON, STEEL, AND CORROSION RESISTANT ALLOY VALVES
AIR DEVICES, LUBRICATORS, AIRCRAFT FITTINGS

self-lubricating. The material is said to be heat resistant, not subject to warping, chemically inert, and corrosion resisting. The assembly, known as the DMC and DPC High Speed Carbon Faced Seals, features a sealing principle designed to eliminate wear on the shaft and the need for replacement of grooved shafts. Gits Bros. Mfg. Co., 1846 South Kilbourn Ave., Chicago.

SYNCHRONOUS MOTORS

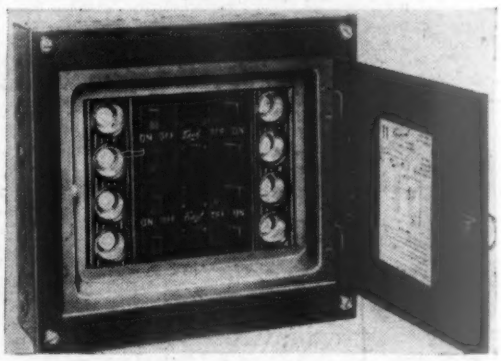
Redesigned line of low-speed synchronous motors features splashproof construction. End-shield covers are removable for motor inspection, and the



pedestal bearings are outside the housing to permit regular inspection of oil supply and oil ring operation. Motor has louvered openings for side air discharge, to save floor space. Conduit box is included in frame structure of the motor. An inspection window is provided in air chute for viewing brush holder and collector without removing covers. General Electric Co., Schenectady.

PANELBOARD

Noark NTPS panelboards for the control of light and small power circuits are available for 4 to 12 circuits. Steel tension spring in switch assembly exerts constant pressure on stationary contact parts for permanent positive electrical contacts. The three current-carrying parts in a circuit are heavier, and the panel's 4-plug fuse and toggle-switch



phenolic units have been redesigned. Shallow depth of the steel enclosure, 3⅞ inches, permits flush type panels to be mounted in thin walls of sheet rock, wall board, masonite, and other materials. Federal Electric Products Co., 50 Paris St., Newark 5, N. J.

SKID BOX

Drop-bottom skid box empties its contents by gravity through a hinged bottom supported by two heavy, removable pins. The boxes may be used with

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L-S Power Fork Trucks, Power JackLifts as well as L-S Hydraulic and Mechanical Hand-Lift Trucks are TOPS in the Materials Handling Field. Rugged, compact, efficient, economical, these trucks can really take it . . . handle your heavy loads day after day . . . Multiply Your Manpower . . . Increase your storage space.

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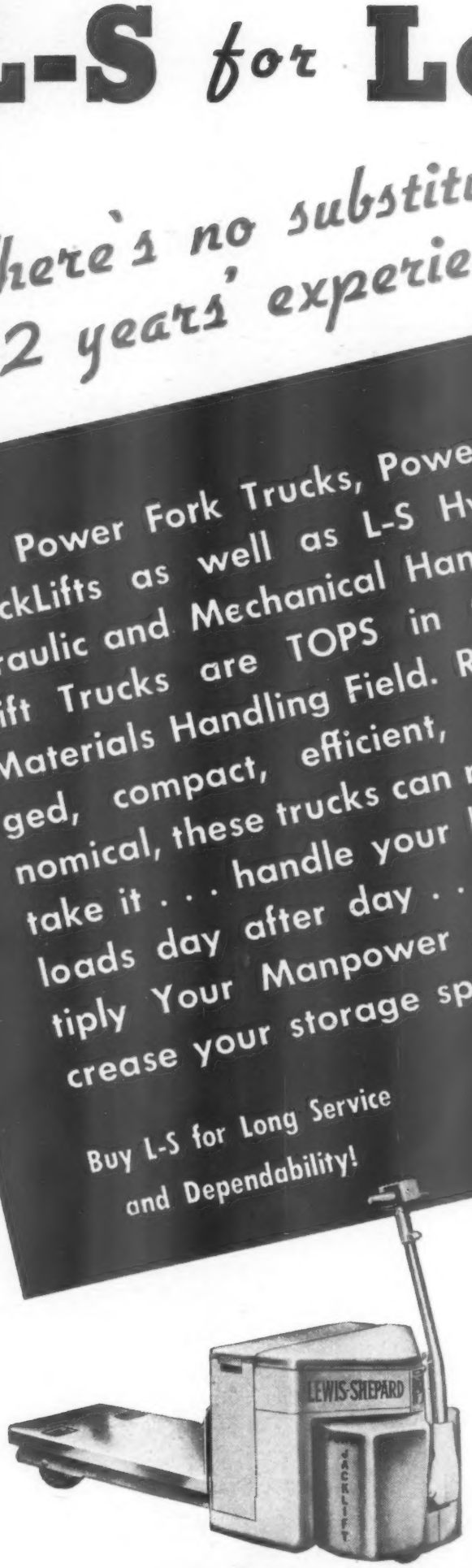

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100% Electric Lift —
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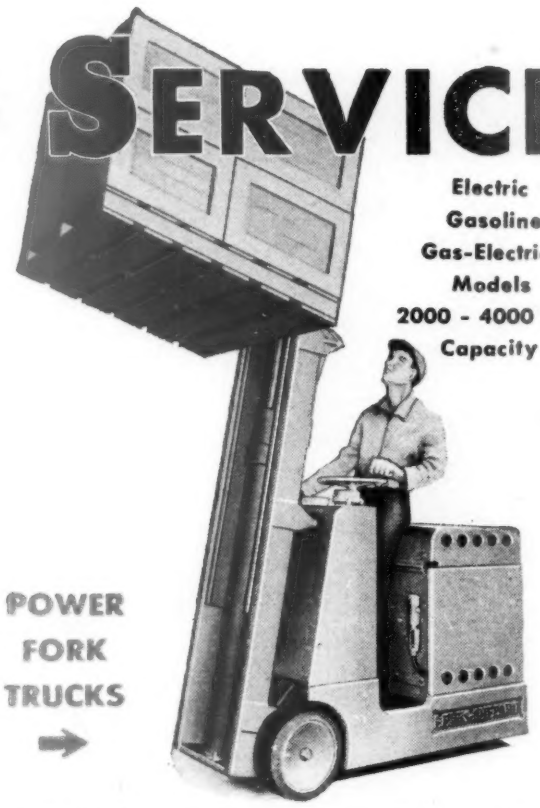

Electric
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2000 - 4000 lbs.
Capacity

POWER FORK TRUCKS →

L-S Fork Trucks "Pivot on a Platter." They turn into narrow aisles and right-angle pile in one single quarter turn. They increase your storage space. Save Time, Save Money!

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5000 lbs. cap.

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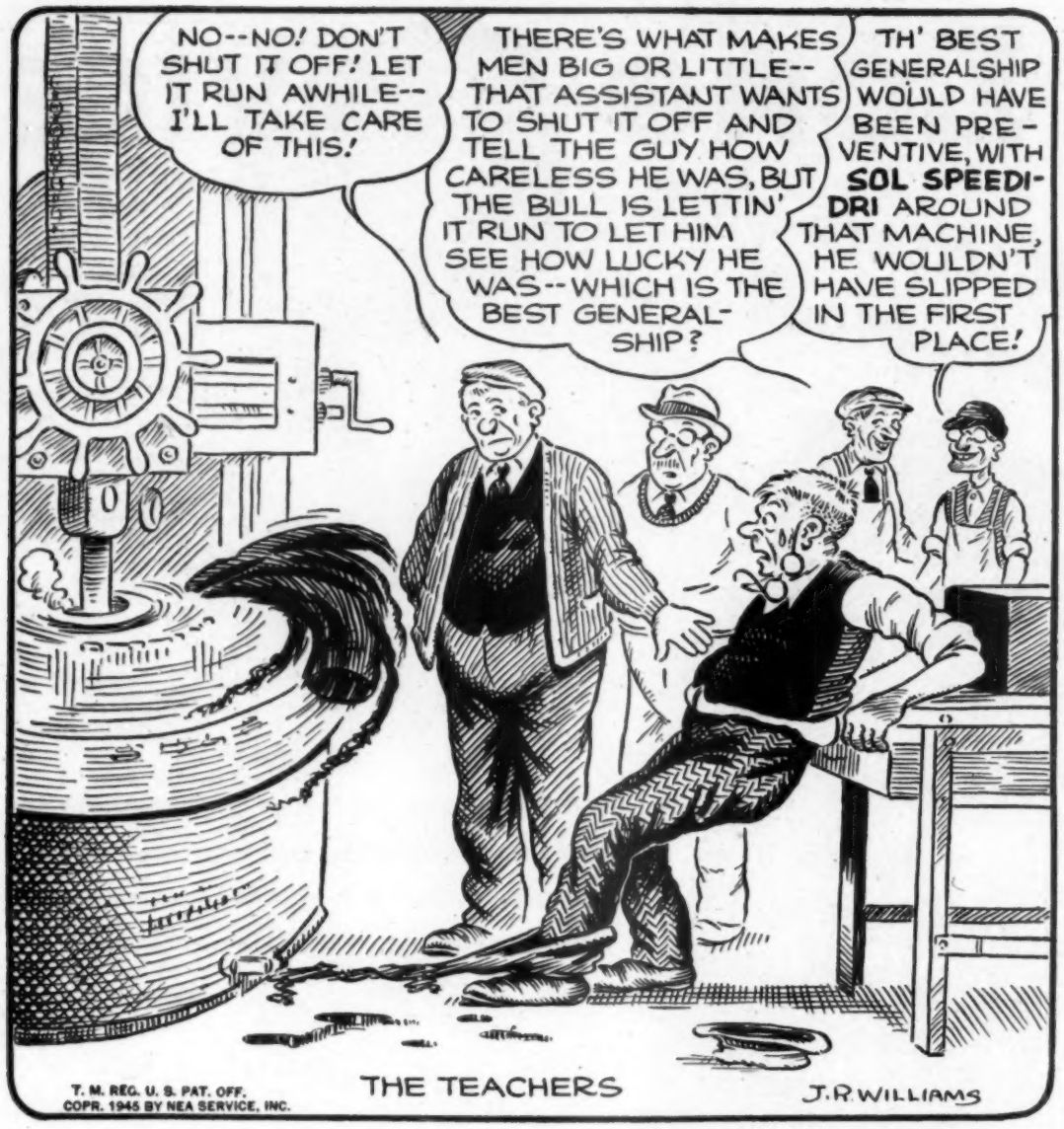
OUT OUR WAY


NO--NO! DON'T SHUT IT OFF! LET IT RUN AWHILE-- I'LL TAKE CARE OF THIS!
THERE'S WHAT MAKES MEN BIG OR LITTLE-- THAT ASSISTANT WANTS TO SHUT IT OFF AND TELL THE GUY HOW CARELESS HE WAS, BUT THE BULL IS LETTIN' IT RUN TO LET HIM SEE HOW LUCKY HE WAS--WHICH IS THE BEST GENERAL-SHIP?
TH' BEST GENERALSHIP WOULD HAVE BEEN PRE-VENTIVE, WITH SOL SPEEDI-DRI AROUND THAT MACHINE, HE WOULDN'T HAVE SLIPPED IN THE FIRST PLACE!
T. M. REG. U. S. PAT. OFF. COPR. 1945 BY NEA SERVICE, INC.
THE TEACHERS
J.R.WILLIAMS

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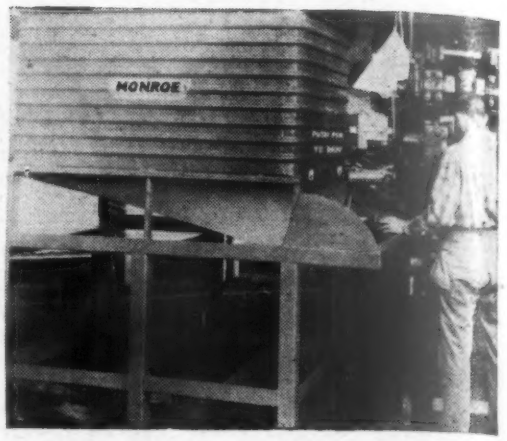
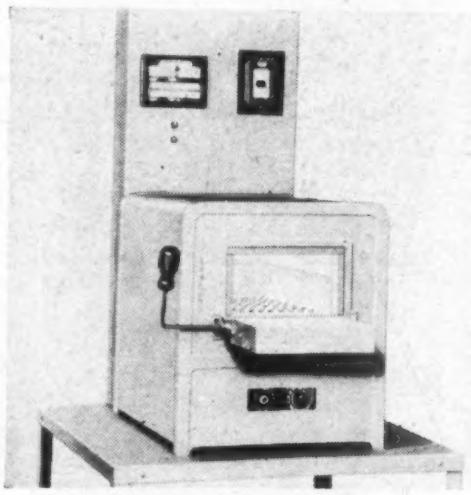
Safety and Maintenance Co., Inc., No. 1 Wall Street, New York 5, N. Y.



ordinary lift trucks, and are constructed of corrugated hot rolled steel in six sizes, with capacities ranging from 1500 to 5000 pounds. Each box is equipped with skids for floor unloading. Stands are available to hold the boxes at a height of 41 inches, and provide waist-high work tables to hold materials released from the boxes. Made of heavy-duty angle iron, they are supplied in sizes for tiered loads from 4500 to 12,000 pounds. Monroe Auto Equipment Co., Monroe, Mich.

SMALL FURNACES

Designed to provide rapid, uniform heating for tempering and other operations at temperatures below 1200 deg. F., furnaces of the recirculating air draw type are available in Model ACL for temperatures to 900 deg. F., and Model ACH, for operation to 1200 deg. F.



Temperature is controlled by a selective power modifier operating with an indicating pyrometer. Heating elements are located behind vertical baffles at either side of the furnace chamber. Power input of the furnaces is 4 kw. at 230 volts. Furnace chamber of Model ACL is lined with mild steel, and of Model ACH is stainless steel. Either furnace will accommodate 50 pounds of parts. For light work, an intermediate plate or shelf can be inserted on rails at sides to double hearth area. Cooley Electric Mfg. Corp., Indianapolis.

SMALL MOTOR

Type B-30-A 4-pole single-phase shaded-pole induction motor has been developed for fractional horsepower a.c. service. The input power is substantially constant from no-load to blocked-rotor conditions when operating under constant voltage, maker says. The motor may be assembled for either clockwise or counter-clockwise rotation. Although the rotation is not reversible after as-

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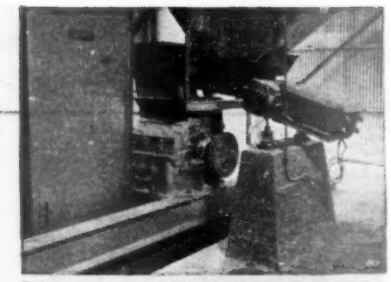
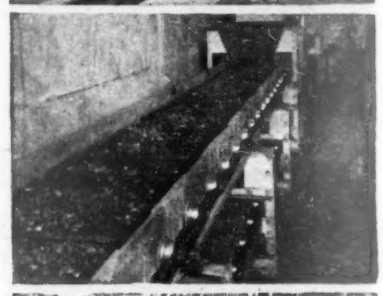
● Three score and ten years ago Jeffrey began improving material handling, mining and processing methods in practically every known industry. During the intervening time knowledge has been accumulated by doing. The length and breadth of this experience makes Jeffrey a reliable source of cost reduction information.

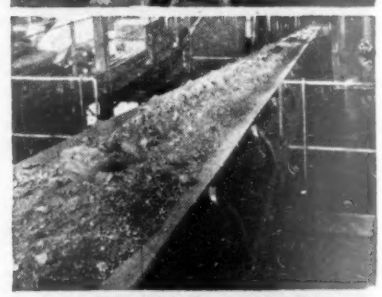
It little matters what branch of industry you select . . . Jeffrey has probably developed and installed material handling and processing equipment to serve it. Steel plants; mines; food processing and meat packing plants; automotive, radio and metal working plants; sewage treatment and water purification plants; power plants and engineering projects . . . the list runs on and on throughout industry, commerce and public service.

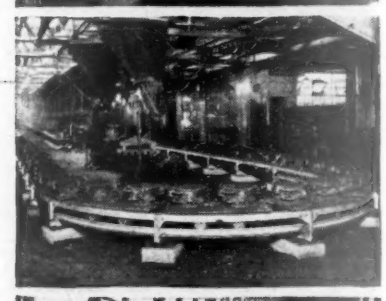
Jeffrey stands ready to place this rich experience at your disposal.

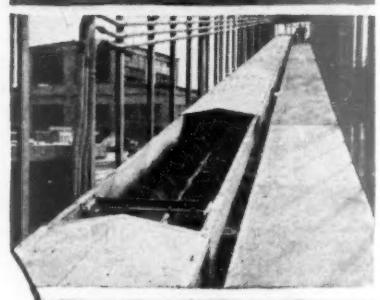
A few typical installation views showing how Jeffrey equipment can be applied to improve material handling methods. These and many others have their specific place in industry. We will be glad to go into detail.











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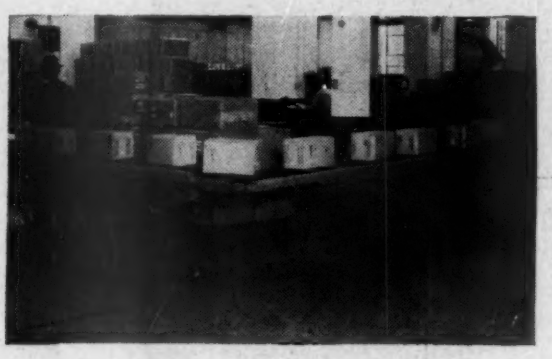
Investigate the use of conveyors. Conveyors handle a wide variety of parts, packages, units, cans, bottles, barrels, bundles, drums and boxes. Available in light, medium or heavy-duty types — portable or stationary — as systems, sections or units — power or gravity fed, they give you remarkable savings in time, money and manpower conservation. They relieve confusion and congestion.

Standard Conveyor Company has the experience and facilities to engineer, recommend and furnish the right type of conveyor for your particular needs.

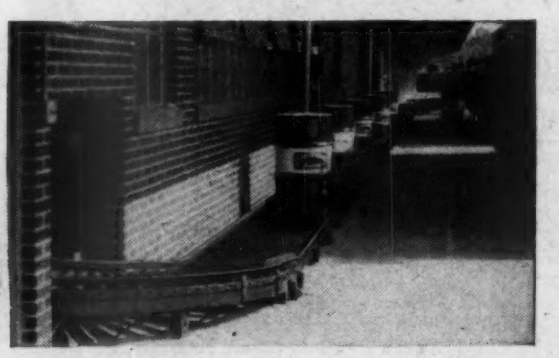
Write today for catalog No. FM 67 "Conveyors by Standard"—a ready reference on conveyor types and systems.

STANDARD CONVEYOR CO.
General Offices: North St. Paul 9, Minn.
Sales & Service in Principal Cities

PRODUCTION LINES
Slat type conveyor used to speed assembly and crating of refrigerators.

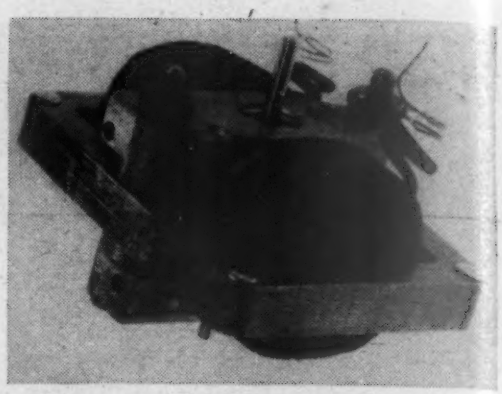


STORAGE AREAS
Portable "Handibilt" conveyors used as a continuous conveyor line in storage area.



LOADING PLATFORM
Oil drums leave the warehouse for loading into boxcars on gravity roller system.

ROLLER • BELT • SLAT • PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS



sembly, a reversible motor can be obtained by mounting two of the motors back to back, using a common $\frac{3}{16}$-in. shaft. Wound for nominal 24-volt, 60-cycle use, the standard motor may also be furnished for 115 volts, 60 cycles, and may be built for 25-cycle use. Gleason-Avery, Inc., Auburn, N. Y.

HAND TRUCKS

Line of hand trucks features a "thrust-absorber" principle, wherein the thrust from the load is carried directly from nose plate to frame, instead of through a

welded joint. Made of 16-gage 1-in. O. D. "furniture grade" steel tubing, the line includes 19 models of different sizes and capacities. Model 23-10 handles crates and boxes over curbs, car tracks, and similar obstructions. Has a capacity of 750 pounds, and weighs 40 pounds. The Ace Co., 12-40 North Orange St., Ocala, Fla.

HYDRAULIC HAND PUMP

Double-action hydraulic hand pump has few moving parts, requires little maintenance, and has large capacity, maker claims. Standard parts are used. Weighing 8 pounds, the pump has a 1¼-in. bore, 1¼-in. stroke, a volume of 1.5 cubic inches per cycle, and operating pressure range from 0 to 1500 p.s.i. Housing measures 7 3/16x3x2½ inches, and is foot-mounting type. Suction and pressure ports, located on the same face, are ⅜ inch NPT. Piston rod is chromium plated, and piston rod bearing is bronze. The 22-in. metal pump handle has round plastic knob, and travels through a maximum arc of 60 degrees. Electrol, Inc., 85 Grand St., Kingston, N. Y.

"BIG LEAGUE" HEAVY HOLDING

Holding 250 pound coils of steel strip with paper tape may sound fantastic, but it is very practical when the tape used is "SCOTCH" Super Strength Tape, or—for smaller coils—"SCOTCH" Extra Strength Tape.

For holding loose ends, "SCOTCH" Tape is applied while coils are still on the mandrels. It adheres immediately and requires no special equipment. Eliminates injuries to workmen caused by sharp edges and ends of metal bands or wire. Holds protective wrapping of burlap or oil proof paper securely—quickly applied. Stands rough handling without breakage.

Steel warehouses, distributors and secondary producers of steel products can benefit from the convenience of using these two tapes for binding their product into tight, compact bundles.

A "SCOTCH" Tape engineer will call at your request and help you with your holding problems. Write today—no obligation.

SCOTCH BRAND Super Strength TAPE

SCOTCH BRAND Extra Strength TAPE

Made in U. S. A. by MINNESOTA MINING & MFG. CO., Saint Paul 6, Minn.

THE 3M COMPANY

"SCOTCH" is the registered trade-mark for the more than 100 varieties of adhesive tapes made by the 3M Company

When you want the right hose...

Call in a man who knows your operations—a man like your Industrial Supply Specialist. He'll recommend the hose expressly designed for your particular job.

For instance, you might be looking for an efficient, heavy-duty air hose that will stand up under the most severe air tool operations and compressor service.

In this case, your Industrial Supply Specialist will suggest Monarch Air Hose. It's "Job-Engineered" by Hewitt to provide extra strength . . . extra stamina. It's the *right* hose for long, trouble-free air tool and compressor service.

And here's why! Its carcass is of special braided construction that eliminates kinking . . . insures high burst-resistance. Yet the hose is highly flexible. Its tube is made of oil-resisting, heat-resisting compounds.

More than that, Monarch Air Hose has a tough Neoprene cover that is compounded to withstand extreme abrasion and heavy impact. And it resists the deteriorating action of oil.

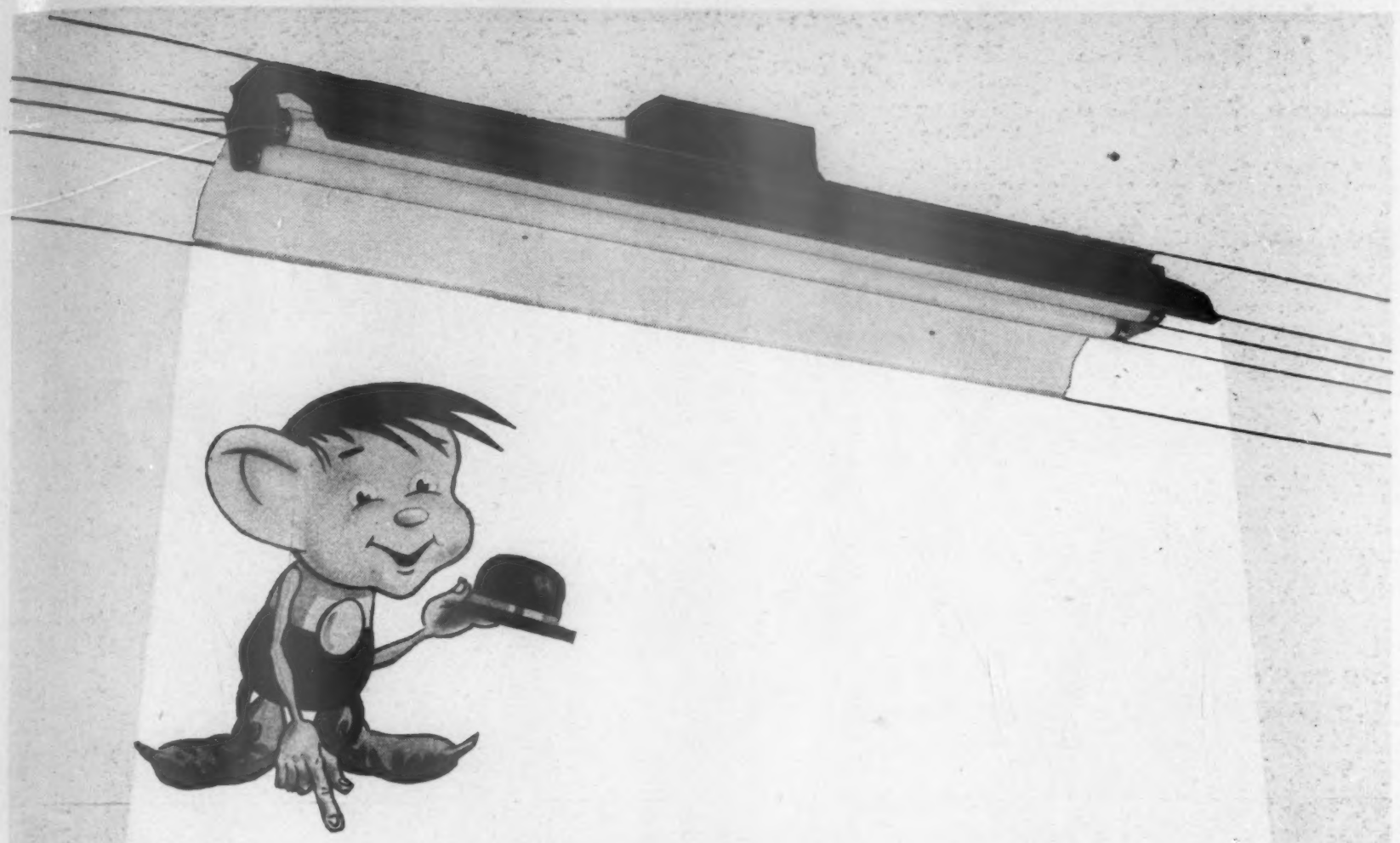
So when you want the right hose, call your Industrial Supply Specialist. He'll recommend the Hewitt product you need to solve your supply problems.

Specify "Hewitt" . . . Phone the Hewitt distributor listed in the classified section of your telephone directory. Or write to Hewitt Rubber Division, 240 Kensington Avenue, Buffalo 5, New York.

Monarch Air Hose

HEWITT RUBBER
DIVISION
HEWITT-ROBINS INCORPORATED
"JOB-ENGINEERED" INDUSTRIAL HOSE • BELTING • PACKING

HEWITT-ROBINS INCORPORATED HR



For the Industrial Lighting Men who want
complete flexibility and interchangeability
in **FLUORESCENT LIGHTING**

IT'S CHAN'L-RUN

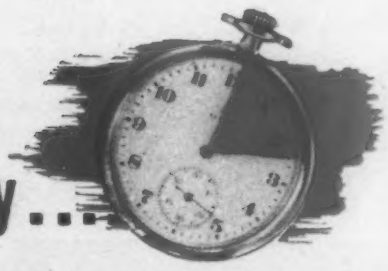
The Basic Lighting System

HOLDENLINE CO.
Pioneers in Fluorescent
2301 SCRANTON RD., CLEVELAND 13, OHIO

Whiting
DOWN
New-
1/4, 1/2, and 1-Ton

Whiting electric hoists save time and effort . . . reduce handling costs . . . keep workers satisfied. It will pay you to do your lifting electrically with the new Whiting hoist.

IF it Saves One Man Only 12 Minutes a day...



IT PAYS A PROFIT!

Releases Men and Machines for Productive Work

Time spent in lifting—either with block and tackle, hand hoist, or sheer muscle—is production time lost. And most workers resent being called away from productive work to do heavy lifting. With the new Whiting electric hoist, you can afford to use electric power for almost every lifting job. If it saves one man only 12 minutes a day, it pays a profit—and remember—a 12-minute saving requires only a minute or two of actual lifting!

To install the Whiting hoist, simply hang it up, plug the cord into the nearest electrical outlet, and it's ready for use. The hoist is so light that one man can easily install or move it without assistance. Investigate this new time- and money-saving hoist.

WHITING CORPORATION, 15689 LATHROP AVE., HARVEY, ILL.

STEEL FROM HOOK TO HOOK
From suspension hook to load hook, the load is supported entirely by shock-resisting steel.

SIMPLE DESIGN—fewer moving parts
The simple worm-gear drive mechanism makes possible lighter weight, greater compactness, and trouble-free operation.

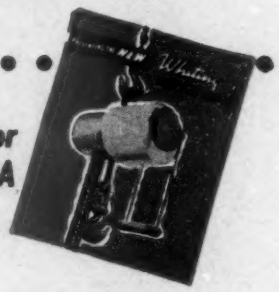
ONE-HAND, BAR-GRIP CONTROL
The single-bar grip provides easy one-hand control, so the other hand can steady the load.

WEIGHS ONLY 87 POUNDS
The simplified construction and the use of high strength materials eliminates excess weight without sacrificing ruggedness.

OPERATES IN AN INVERTED POSITION
Where there are obstructed or hard-to-reach suspension points, the hoist may be inverted and the load attached directly to the hoist.

DUAL-VOLTAGE MOTORS
By a simple change in connections, the user can quickly convert the motor from 220 to 440 volts, or from 440 to 220 volts.

Write for Bulletin H-100A



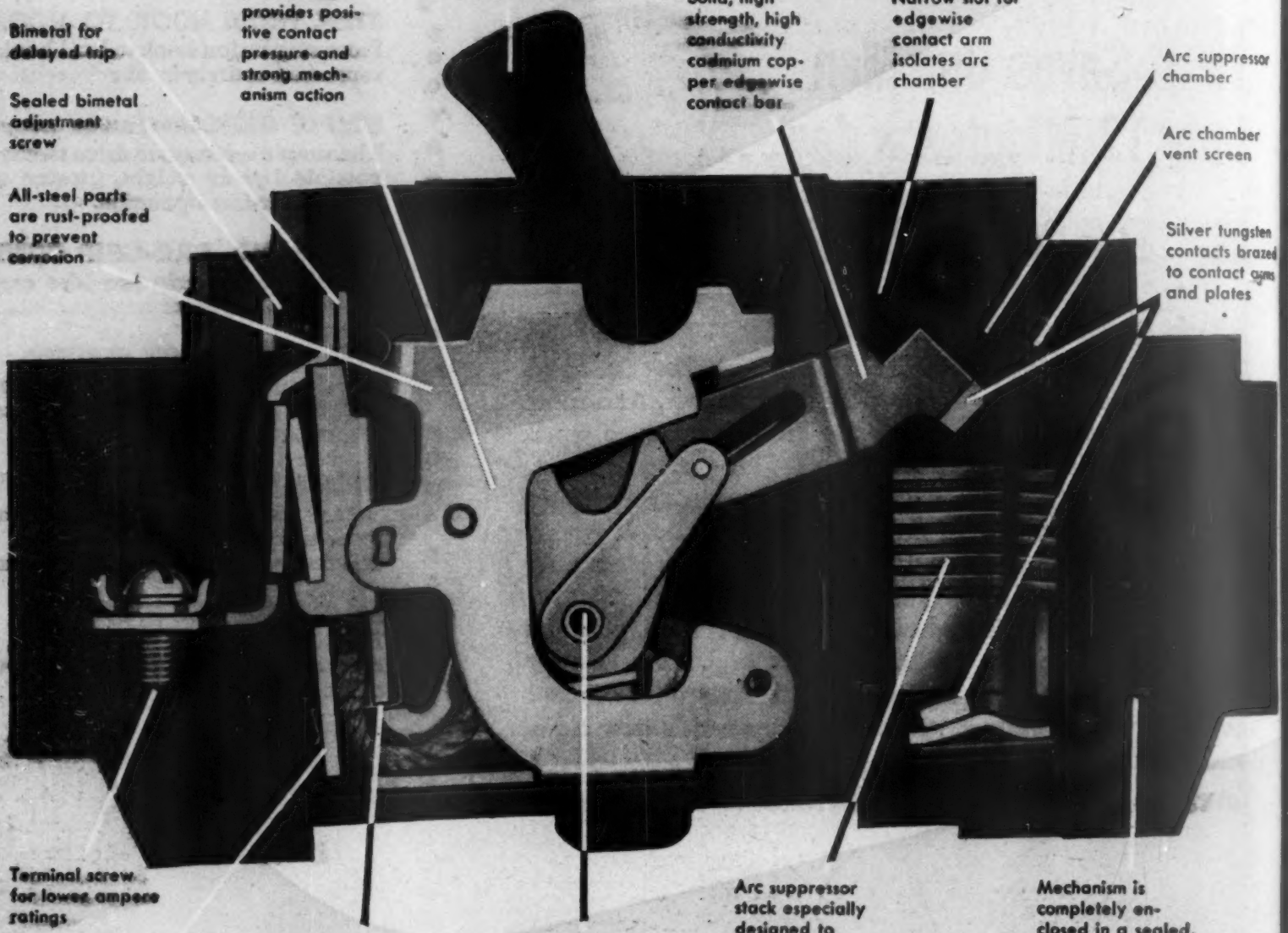
WHITING

ELECTRIC HOISTS

FOR FAST, ECONOMICAL, EFFORTLESS LIFTING

New QUICK TRIP MAKE BREAK

Type ML A.C./D.C. 1, 2, or 3 Pole, 15 to 50 Amperes


Bimetal for delayed trip
Sealed bimetal adjustment screw
All-steel parts are rust-proofed to prevent corrosion
Main spring (concealed) provides positive contact pressure and strong mechanism action
Strong cross section molded bakelite handle
Solid, high strength, high conductivity cadmium copper edgewise contact bar
Narrow slot for edgewise contact arm isolates arc chamber
Arc suppressor chamber
Arc chamber vent screen
Silver tungsten contacts brazed to contact arms and plates
Terminal screw for lower ampere ratings
Coilless magnetic trip element
Stainless steel sensitive latch
Bearing surfaces are hardened to reduce wear
Arc suppressor stack especially designed to instantly rupture both direct and alternating currents
Mechanism is completely enclosed in a sealed, compact, molded bakelite case to prevent tampering

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

In Canada: SQUARE D CANADA, LTD., TORONTO, ONT. • *In Mexico:* SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

THERMAL-*Coilless*-MAGNETIC CIRCUIT BREAKER

For Direct or Alternating Current Systems

This new and vastly superior Square D thermal-magnetic breaker has a unique *coilless* magnetic tripping mechanism which causes it to open instantly on moderate as well as heavy short circuits. A quick-make and quick-break mechanism of simple and rugged construction is incorporated in this breaker to assure long life and trouble-free service.

A new line of lighting panelboards, using these new breakers, is now available for delivery.

The ML A.C./D.C. breakers are designed for use on either direct or alternating current systems where 1, 2 or 3 pole circuits are required.

Features

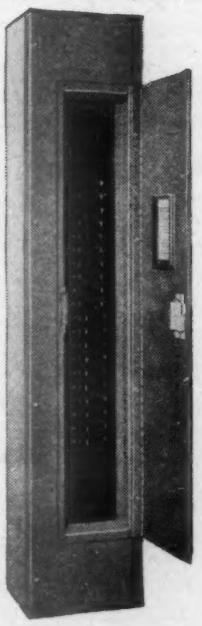
- HOLDS MOMENTARY OVERLOADS (thermal trip)
- TRIPS FAST ON SHORT CIRCUITS (*coilless* magnetic trip)
- QUICK-MAKE, QUICK-BREAK (manual operation)
- QUICK-BREAK (automatic operation)
- MEETS FEDERAL SPECIFICATION WP131A FOR CLASS 1 BREAKERS

ML A.C./D.C. Enclosed Circuit Breakers

ML A.C./D.C. breakers are ideal for motor or branch circuit wiring and are also furnished in general purpose industrial and service equipment enclosures.

NA1B PANELBOARDS

NA1B lighting panelboards, using the new ML A.C./D.C. breakers, are ideally suited for factories, schools, hospitals and other buildings where safety and dependability are of prime importance. Available in double row single pole breakers up to 42 circuits; also in single row column type up to 32 circuits.



PART OF THE PARADE OF NEW DESIGNS

Write for Information.

Square D Company, 6060 Rivard St., Detroit 11, Michigan.

Good work, Bill—Employers Mutuals like to pay claims promptly

Bill Sanders is regular. He, too, likes to settle the claim of a policyholder—promptly.

Bill is specially trained to carry out Employers Mutuals fundamental policy of operating for the benefit of policyholders. Like practically all E-M claim adjusters, he is directly employed by Employers Mutuals.

Bill knows why Employers Mutuals like to pay claims. He knows that prompt settlement of claims creates enduring friendship for his companies.

Like all Employers Mutuals people, he wants to make insurance understandable. He knows that fair settlement of claims helps policyholders understand the real purpose of insurance—a small investment to provide protection against the loss of a large investment.

To Bill that underlying purpose of insurance simply means one thing—that the man who has bought insurance is entitled to the prompt payment of a claim made by him or against him for a loss covered by his policy. That is why Bill and the man who puts in the claim are able to arrive so quickly at a fair settlement.

Bill is proud of Employers Mutuals—proud to be a part of this group that is conservatively managed, ably directed, and soundly progressive in ideas and ideals.

And Employers Mutuals are proud of Bill and all their men like him. The continued commendation of fairness and promptness in settling claims is all they need as evidence of the valuable service these men perform for Employers Mutuals and for E-M policyholders.

Because they operate solely to benefit their policyholders, Employers Mutuals like to pay claims—promptly.

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN Established 1911

EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
Established 1935

Home Office: WAUSAU, WISCONSIN

EMPLOYERS MUTUALS of WAUSAU

The story of an idea that worked its way up to a national reputation

PROMPT claim settlement is only one example of the far-reaching effects of an idea as simple as the Golden Rule.

That idea—to operate entirely for the benefit of the policyholders—is the guiding philosophy of Employers Mutuals.

Saving lives, eliminating occupational disease, reducing accidents, physiotherapy for injured workers, programs to educate workers in safety, preventing fraud and dishonesty of employees, reducing the chance of fire losses, unusual care in writing policies to assure adequate coverage—all these provide for the welfare of the policyholder.

All have grown out of the philosophy that has inspired the confidence of policyholders throughout the country.

Take, for example, fire prevention service—outgrowth of our nationally acclaimed safety engineering. Fire prevention engineers survey the plant of a policyholder and make recommendations for the elimination of hazards. Employers Mutuals fire insurance protects against financial loss from fire. E-M fire prevention service reduces the chances of loss by fire.

Our long experience has given us unusual knowledge of industrial requirements. Our representatives are carefully trained to study your individual requirements in order to provide complete protection. And careful, conservative management makes possible additional savings in the form of dividends.

Employers Mutuals can save you money

An E-M representative will be glad to analyze your present insurance. Then you will know whether you have too much or too little coverage for adequate protection. He will bring in E-M engineers to survey your plant and help you set up a safety program that will lower your accident rates and reduce your insurance costs.

Or write for full information on workmen's compensation, fire, public liability, or any of the allied lines of insurance. We will include "A Dictionary of Insurance Terms" to help you understand insurance. Write—on your business letterhead, please—to: **Insurance Information Bureau, Employers Mutuals of Wausau, Wausau, Wis.**

EMPLOYERS MUTUALS of WAUSAU

. . . MAKE INSURANCE UNDERSTANDABLE

HAVE YOU A PROBLEM FOR US?

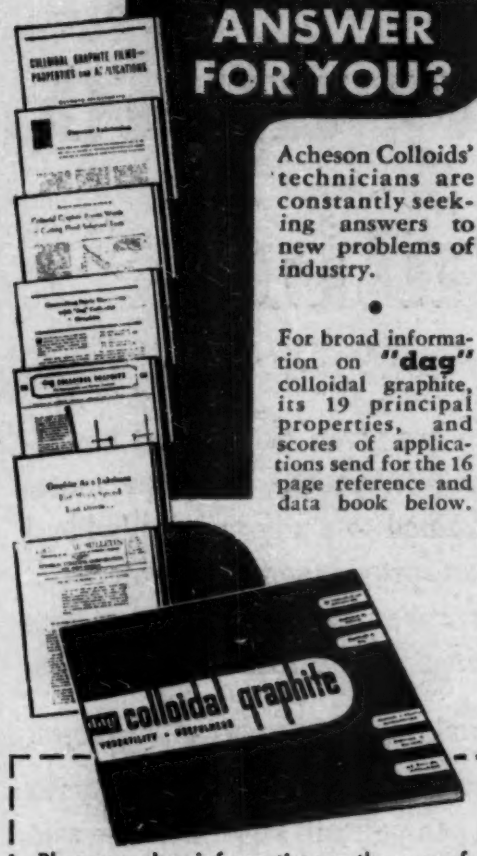
"dag" colloidal graphite, in a variety of carriers, has been the one practical answer to many knotty problems involving high or low temperature lubrication, cutting oils, dry film lubrication, electrical conductivity, and opacity.

HAVE WE AN ANSWER FOR YOU?

Acheson Colloids' technicians are constantly seeking answers to new problems of industry.

•

For broad information on **"dag"** colloidal graphite, its 19 principal properties, and scores of applications send for the 16 page reference and data book below.



Please send us information on the uses of **"dag"** colloidal graphite:

- 16 page data and reference book ☐
- Parting Compounds ☐
- Dry-Film Lubrication ☐
- Impregnation of fabrics, porous metals, leathers, etc. ☐
- Press Fitting ☐
- Lubricants for forging, drawing and extruding ☐
- Oil Additives for boundary conditions ☐
- Running-in New Equipment ☐
- Elimination of Static-Sparking ☐
- Cutting Fluids ☐

ACHESON COLLOIDS CORPORATION

Port Huron, Michigan, Dept. F-6
Please send me without obligation, a copy of each of the bulletins checked:

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Our present oil supplier is.....

dag COLLOIDS REG. U.S. PAT. OFF.

(Lubricants containing **"dag"** colloidal graphite are available from major oil companies.)

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

SMALL-PARTS CONTAINERS with clear plastic lids provide full vision of contents when closed. Offer several storage advantages for small objects and materials. The Buckeye Stamping Co., Columbus 7, Ohio.

STRESS-STRAIN CALCULATOR determines yield strengths of alloys—aluminum, brass, copper, and others. The method of use enables one operator unassisted to compute yield strengths. Aluminum Research Institute, 111 West Washington, Chicago 2.

BUNSEN ICE CALORIMETER, modified type, offers precision, high sensitivity, inexpensive operation. The National Bureau of Standards, Washington 25, D. C.

POWER MOWER cuts weeds, brush, tall grass; cuts under fences and shrubs. According to the manufacturer, the machine enables one man to mow 4 to 6 acres in an 8-hour day. Jari Products, Inc., 2938 Pillsbury Ave., Minneapolis.

EXTENSION CORD REEL pays out electric cord evenly and rewinds it automatically. Benjamin Reel Products, Inc., 10700 Broadway, Cleveland 5.

HOLE LOCATOR for tool and die shops offers rapid precision for making layouts or using the locator directly as a jig. The DoALL Co., Des Plaines, Ill.

MACHINE GUARD made of plastic is applied over rotating machine spindle. Designed to salvage dust of precious metals at point of operation, the guard affords full vision and safe operation. The Dilley Mfg. Co., 1656 Ansel Road, Cleveland 6.

PAINT STRIPPER is said to be non-flammable yet capable of penetrating through more than one layer of paint at a time because of its slow evaporation. It may be used on horizontal or vertical surfaces. Turco Products, Inc., 6135 South Central Ave., Los Angeles 1.

STEEL STRAPPING is said to form easily around all objects and have strong tensile strength. Available in all standard sizes. A. J. Gerrard & Co., 221 North LaSalle St., Chicago 1.

NLRB CASE STUDY outlines one company's difficulties in maintaining a status of free collective bargaining for the period 1933 to 1947. The study, which is in reprint form, factually underscores the need for defining and limiting the

MECHANICAL PALLETIZER loads and cross-ties packages on pallets. Machine is said to be completely automatic. Production Aids, Inc., 6842 Beck Ave., North Hollywood, Calif.

Borderline Vision*

may be dimming your production picture

DON'T be too sure lighting that looks all right at a glance isn't slowing your production. Borderline Vision—lighting that's just a *shade* too dim—is hard to spot.

You can make sure your light *is* right easily today by installing Wheeler Skilled Lighting.* Skilled Lighting is a carefully engineered product that has been paying dividends to manufacturers since 1881 in increased, *better* work—higher employee morale—and decreased costs. Wheeler

Which side of this line is your lighting?

Reflectors give maximum illumination from standard lamps because they *control* light. Their high reflection factor puts light to work where it belongs—on the job.

You'll see that difference in a brighter production picture when Skilled Lighting goes to work for you. Write Wheeler Reflector Company, 275 Congress St., Boston 10, Mass. Also branch offices in New York and principal cities.

Distributed Exclusively Through Electrical Wholesalers

All-Steel Fluorescent Unit

For 2 or 3 40-watt, or 2 100-watt lamps. Available with open or closed end porcelain enameled reflectors. Broad wiring channel with accessible enclosed ballast. For individual or continuous runs.

RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency indoors or out. Expertly designed, ruggedly built. Vitreous enamel only. 75 to 1500 watts.

Wheeler REFLECTORS

SKILLED LIGHTING

MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881

CRESCENT JOINTER

Helps you produce a smoother finish . . . with four knives in the cut instead of only three

YOUR Crescent Jointer puts more knives into action: There are four knives in the cutterhead—instead of the usual three. *More* knife-cuts per inch of stock travel mean smoother finished work; fewer knife-cuts per inch frequently cause knife marks, or small ridges, to show across the stock.

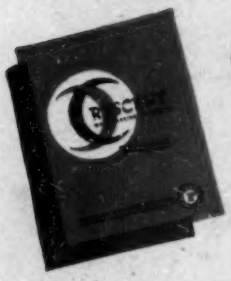
The four-knife head is just one Crescent operating advantage. There are many others, resulting from Crescent's more than fifty years' experience in building precision woodworking machinery.

For example, inclined machined ways support tables on the base. The ways are adjustable, to facilitate perfect table alignment.

The Crescent 8" light Jointer is available on cabinet-type base. The frame or base on the heavier 12" and 16" models is a close-grained, one-piece casting.

Equip with Crescent Jointers. Profitable performance justifies your choice: your output goes up, your production costs go down. See your Crescent dealer soon.

CRESCENT MACHINE DIVISON
Rockwell Manufacturing Co.
LEETONIA, OHIO



FREE!

Catalog of Crescent Woodworking Machinery. Illustrates and describes the entire line in detail. Organized to give you quickly the information you need, to do an intelligent job of selecting equipment. Use coupon at right to request your copy.

CW-168

TEAR OUT COUPON AND MAIL TODAY!

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Send me, without obligation, a free copy of Crescent Woodworking Machinery catalog.

Name.....
Title.....
Company.....
Address.....
City.....(.....) State.....

powers of the NLRB in the interest of justice. Thompson Products, Inc., Cleveland, Ohio.

DUST CONTROL CARTRIDGE automatically proportions solidified wetting compound into water line. Each cartridge is designed to make 1000 gallons of "wet" water for dust control and firefighting. The Johnson-March Corp., 52 Vanderbilt Ave., New York 17.

FILING LIGHTS, fluorescent type, are designed to rest on top of any file cabinet. Lights give good vision at point of work and permit relocation of files to make use of dead space in poorly lighted areas. W. H. Long Co., 425 North Clark St., Chicago.

CHROME PLATING AID blankets solution with plastic tubes that float on the surface of the plating bath and lessen the escape of fine spray. Tubes are made of Styron (a Dow product) by the Udylite Corp., 1651 East Grand Blvd., Detroit 11

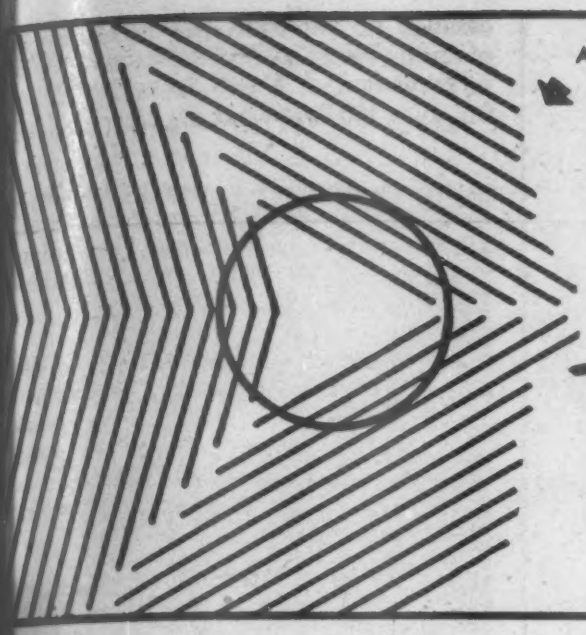
PUBLIC RELATIONS BROCHURE presents a series of newspaper advertisements used by Talon, Inc., Meadville, Pa., to acquaint its plant communities with the company, its products, and industry economics. Copies may be had by addressing a request to FACTORY MANAGEMENT AND MAINTENANCE, 330 West 42nd St., New York 18.

PROTECTIVE HOLDERS are made of double transparent fireproof plastic. Special features include two eyelets that make it possible to hang the holders horizontally or vertically. G. J. Aigner Co., 503 South Jefferson, Chicago 5.

FIRST AID—eye fountain washes out eyes that have been exposed to irritants or foreign objects. Cast aluminum bowl fits upper contours of face. Water pressure may be regulated to assure copious, easy flow. Precision Scientific Co., 3737 Cortland, Chicago.

MOLDING ALLOY is designed to anchor drill jig bushings and other parts quickly and accurately. Advantages, according to the manufacturer, are simple application and unusual stability. Trethaway Associates, 37 Wall St., New York.

PORTABLE GEIGER COUNTER is battery-powered to adapt it for field survey work. Instrument may be used in its

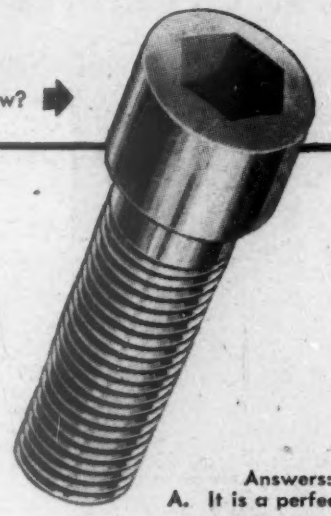


A. Is this a perfect circle?

Look Again!

DO YOUR EYES DECEIVE YOU?

B. What size is this socket screw?



Answers:
A. It is a perfect circle.
B. No question if it's Size-Marked!

● "Eye-gauging" shapes or sizes quickly and accurately isn't reliable, even for experts. Many a shop veteran failed in a recent test that required judging the size and pitch of an ordinary socket screw. It proved that "miking" is the only sure way to avoid errors . . . but that takes *time*.

The SIZE-MARK on the head of every P-K Socket Head Cap Screw ends gauging or guessing. It's an "exclusive" P-K feature . . . developed after an extensive study of shop practice.

Tool crib bosses like the SIZE-MARK because it speeds up sorting of left-over, mixed-up screws . . . eliminates waste. Assembly workers like it because it speeds the job. Apprentices like it because it helps them learn faster—work faster. And sales managers recognize its advantages to customers' service men in the field on reassembly jobs.

PLUS* . . . GEAR GRIP

Makes fingers fly faster . . . because it prevents them from slipping even when oily. Only P-K offers Socket Head Cap Screws with both features.

SAMPLE KIT FREE. Compare and judge for yourself. Write Parker-Kalon Corp., 200 Varick Street, New York 14, N. Y.

You're sure at a glance
IF IT'S P-K... IT'S SIZE-MARKED

P-K SOCKET SCREWS ARE AVAILABLE
FOR PROMPT DELIVERIES. SEND FOR STOCK LIST NOW.

*U.S. Pat. No. 126,409

SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS

PARKER-KALON *Cold-forged* SOCKET SCREWS

Another P-K First—*GROUND THREAD* Socket Set Screws

● Smooth, mirror-bright, clean-finished threads—centerless ground on hardened blanks. Accurate contour and lead, dependable Class 3 Fit. Free from imperfections common to ordinary cut thread set screws . . . a "shining example" of good workmanship. Ask for samples. You'll see the difference.

—and first in line with features that win approval wherever fresh, cool, sanitary drinking water is needed. OASIS Electric Water Coolers are made in a complete range of portable bottle or pipe-connected pressure models for every need. Stainless steel tops of enduring beauty, easy dial-type bubbler action, generous storage capacity and rugged cabinets of compact beauty are among the many OASIS advantages developed by EBCO during their 20 years of water cooler leadership. Write for complete details.

EBCO glass fillers also available.

THE EBCO MANUFACTURING COMPANY
401 W. Town St., Columbus 8, Ohio

Speeds Up Inplant Handling

● Complementing and supplementing power equipment, the FMC Clamp Truck is uniquely designed to handle boxed loads up to 600 pounds *quickly* and *easily*.

● Powerful clamp arms operated by a foot pedal pick up and hold loaded boxes and baskets firmly in place. Ideal for crowded areas inaccessible to larger carriers. Built for long time rugged service.

● Not just another hand truck, but a boon to the operator that soon pays its way in time saving. For descriptive catalog write Dept. FM-1

FOOD MACHINERY CORPORATION
RIVERSIDE DIVISION • RIVERSIDE, CALIFORNIA

cabinet or removed for hand use in scanning areas where radioactivity is to be investigated. North American Philips Co., Inc., 100 East 42nd St., New York 17.

EAR LAMP supplies warmth for relief of earaches and inflammation. Small radiant heat source directs infra-red rays along the aural canal to the middle ear. Lamp is comfortable and easy to keep sanitary. Air-Shields, Inc., Hatboro, Pa.

NEW ALLOY with important test characteristic for watch mainspring manufacture has possible application for manufacturing razor blades, stainless cutlery, surgical instruments, and other products. Elgin National Watch Co., Elgin, Ill.

FULL-COMBUSTION HEATER, coal-fired and said to be smokeless, uses cross draft to force smoke through fire bed. Operating cost is said to be halved, with a one-load burning time of 16 hours on high firing and 72 hours, banked. Moore Corp., Joliet, Ill.

POCKET-SIZE SPIRIT LEVEL for plumbing and heating work is molded from transparent Plexiglas. Markers for six different angles are molded into the level and are indicated by fluids in different colors. Lawco Plastic Products Co., Chicago; and Sobenite, Inc., South Bend, Ind.

WIRE MARKERS have tab feature to make coding faster. Tab provides more leverage for binding end of the marker to the wire. Western Lithograph Co., Los Angeles 54.

PACKAGE FILLER, ⅓-oz. to 10-lb. capacity, fills granular, crystalline, pulverized, or paste materials into rigid or non-rigid containers. Moving parts are enclosed and filler has emergency shut-off switch. George C. Rodgers Co., Inc., 225 W. 34th St., New York 1.

FILM CATALOG, "The Index of Training Films," lists motion pictures and slide-films for industrial training use. Eastman Kodak Co., Rochester 4.

FILMS:
Only a Gasket, sound, color, shows engineering research and manufacturing techniques relating to the use of gaskets in industry. Distributed by Hathen Productions, Philadelphia 3, for Goetze Gasket & Packing Co.

RIGHT DOWN YOUR AISLE!

Narrow aisles are no obstacle to the Hyster "20". The compact unit, only 36" wide, is a money-saver in crowded factories, warehouses; loading and unloading box cars. Hyster makes seven models—from the 2000-lb. capacity "20" to the 30,000-lb. capacity MH Straddle Truck. Write for catalogs.

Crowded for room? Space at a premium? Material handling costs too high?

TRY OUT A HYSTER "20"

The 2000-lb. capacity Hyster "20" is made to order for narrow aisles in warehouses, factories, parts departments, box cars, in any close quarters. Only 36" wide with rounded rear end it can turn in tight spots and crowded spaces.

Pneumatic tires also are factors in Hyster's maneuverability. The "20" is equally at home on smooth or rough surfaces, indoors or outdoors. And the powerful air-cooled gasoline engine gives you speed up to 12 m.p.h. in either direction.

Conventional controls — two speeds forward and two speeds reverse—make the "20" as easy to operate as a passenger car.

Hydraulic lift hoists 2000 lbs. 9 feet. Other lifts from 6' to 12' are available, as are special lift truck tools for out-of-ordinary jobs.

The Hyster "20" is saving time — labor — money in every type of industry. It can do the same for you . . . If you have a hoisting, stacking or transporting problem, if you want to make use of "free" air space, your investment in a Hyster "20" will be highly profitable. Call your Hyster distributor; write for Catalog 1055.

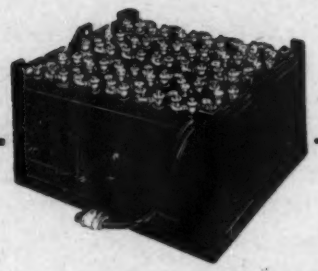
HYSTER COMPANY

2956 N. E. Clackamas St., Portland 8, Oregon
1856 North Adams Street, Peoria 1, Illinois

Distributors in Principal Cities

POWER FOR TRUCKS THAT MUST WORK—

24 hours a day... EVERY DAY!



In Industrial Trucks,* EDISON *Nickel-Iron-Alkaline Batteries Give You These Important Advantages

- ★ **They are durable mechanically; grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.**
- ★ **They can be charged rapidly; gassing cannot dislodge the active materials.**
- ★ **They withstand temperature extremes; are free from freezing hazard; are easily ventilated for rapid cooling.**
- ★ **They are foolproof electrically; are not injured by short circuiting, reverse charging or similar accidents.**
- ★ **They can stand idle indefinitely without injury. Merely discharge, shortcircuit, and store in a clean, dry place.**
- ★ **They are simple and easy to maintain.**

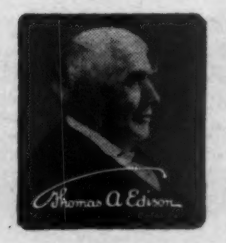
Illustrated above is a material-handling job for which trucks must be kept on duty 24 hours a day, every working day. It is the kind of job in which battery industrial trucks excel because of their dependability and economy.

With batteries exchanged two or three times a day, the truck is kept continuously supplied with power. While one battery is being charged, another operates the truck.

IDEAL POWER CHARACTERISTICS

The truck starts instantly, accelerates smoothly; operates quietly; gives off no fumes; consumes no power during stops. Thus, it makes efficient use of power, and the current used for charging its batteries is the lowest-cost power available. Its electric-motor drives have a minimum of wearing parts and are inherently simple and trouble-free.

A battery industrial truck is most dependable and most economical when powered by EDISON Nickel-Iron-Alkaline Batteries. With steel cell construction, a solution that is a natural preservative of steel, and a fool-proof principle of operation, they are the most durable, longest lived, and most trouble-free of all types of batteries. ***Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey. In Canada: International Equipment Company, Montreal and Toronto.***



EDISON

NICKEL • IRON • ALKALINE

BATTERIES

HOW WE TOOK THE SOCK OUT OF SHOCK!

Another top performance by a BWH product

These huge, prefabricated slabs are the new "face" of a large western dam. Before they're applied, the surfaces must be cleaned with sand. And the entire face of the dam must be chipped and sand blasted in preparation for the new facing slabs. Doing these jobs with old-style sand blast hose often gave the operator an electric shock, sometimes very severe.

The reason is simple: Modern cutting agents and their increased velocities build up static electricity by friction. It accumulates along the interior of the hose tube . . . finally explodes like a miniature bolt of lightning . . . sometimes destroying the usefulness of the hose. But, much worse, it can give the operator a bad jolt.

BWH engineers went to work on this problem. They developed Bull Dog Sand Blast hose, featuring a specially compounded rubber tube stock that carries off most of the static electricity through the tube itself. What's left isn't enough to damage the hose. And the danger of shock to the operator is greatly minimized.

The "shock-absorber" tube of this Bull Dog Sand Blast Hose is wrapped with strong rubberized duck and enclosed in an abrasion-resisting cover. The hose works so well that it has been approved by countless safety engineers. It was used exclusively on this dam refacing job . . . with excellent results.

Bull Dog Sand Blast Hose is just one of the many quality products manufactured by BWH. Whatever your need for industrial rubber goods, look to BWH for dependable ruggedness . . . BWH distributors for dependable service.

* * *

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems . . . we're specialists in solving them. Consult your nearby BWH distributor or write direct.

Another Quality Product of

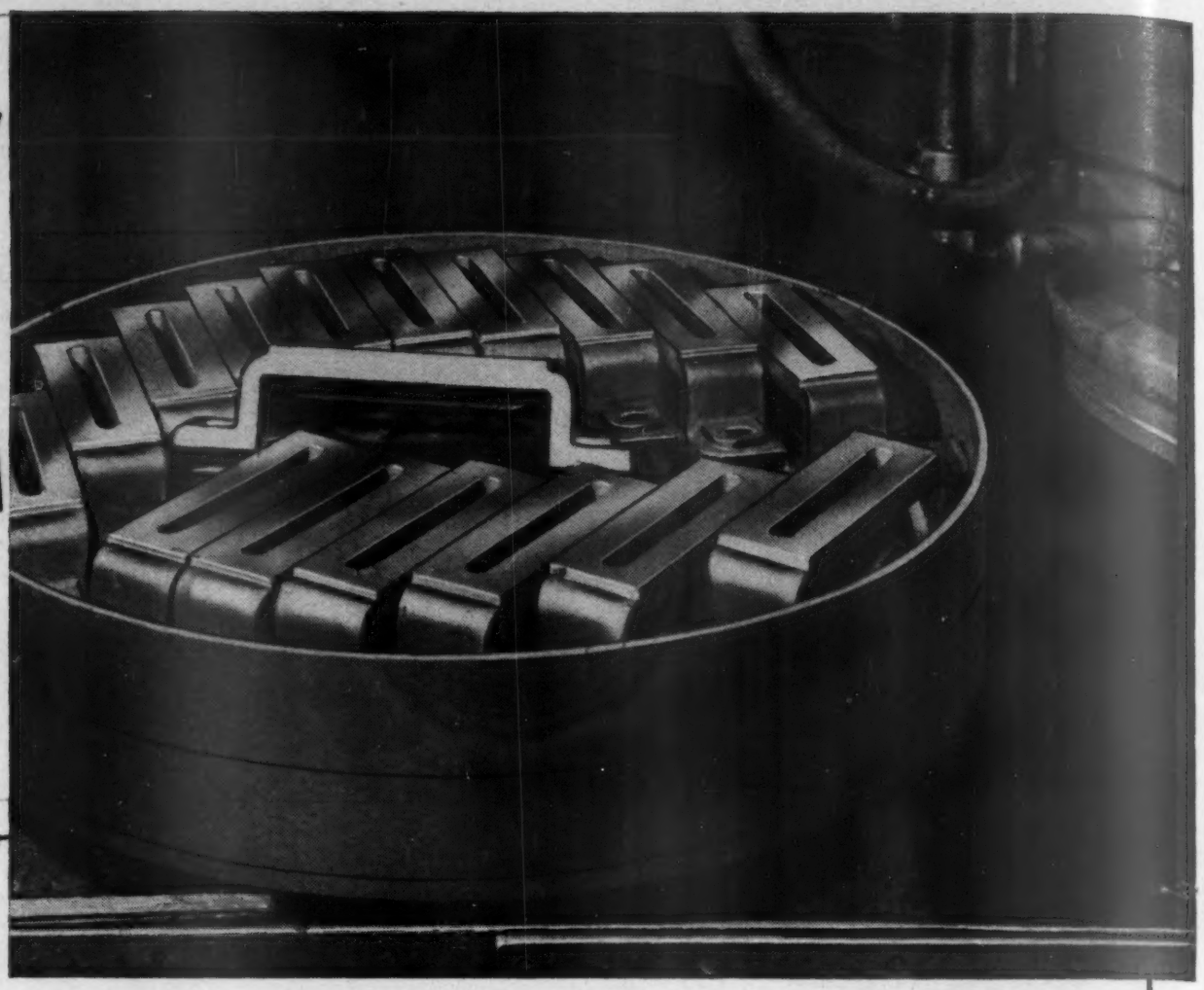
BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in All Principal Cities

WORKS: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

6 REASONS WHY A BLANCHARD

"HOGGED" THIS JOB AWAY FROM A PLANER



THE JOB...

● The illustration shows 17 doffer drawing pulley brackets being held on a 36-inch chuck of a No. 18 Blanchard Surface Grinder. Material is cast iron. Rough size $15\frac{3}{8}''$ x $3\frac{1}{2}''$ x $3\frac{3}{4}''$. Two sides—the top and the feet—are ground, in two operations, to make the height $3\frac{7}{16}''$. Commercial finish required.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1. Greater PRODUCTION: Previously planed in 43.8 minutes each. *Now Blanchard-Ground in 5.4 minutes each, or in* $\frac{1}{8}$ of the time previously required.

2. Saved a FIXTURE: Blanchard Grinding eliminates the use of a holding fixture previously necessary.

3. Saved MATERIAL: Blanchard Grinding permits less allowance for finish, and saves many pieces that would otherwise have been "salvage".

4. Greater FLATNESS:
5. Finer FINISH:
6. Closer LIMITS:

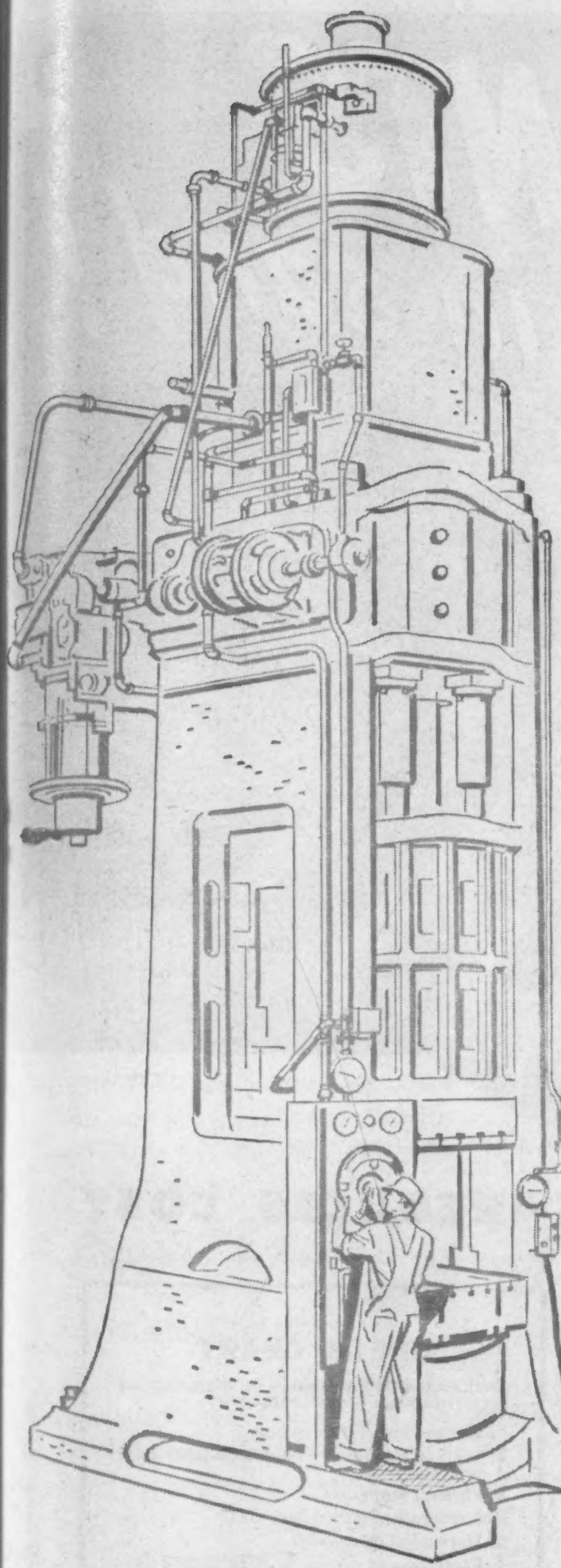
These are so effortlessly produced by Blanchard Grinding that—on jobs such as illustrated—you get all three of them as "by-products" from the use of:

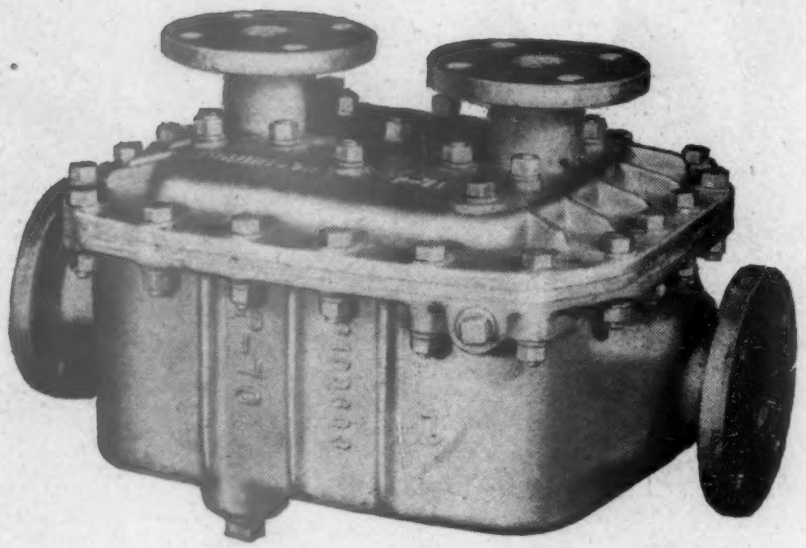
THE MOST EFFICIENT METHOD OF PRODUCING FLAT SURFACES

Whether your grinding requires hogging cuts or light finish cuts, fine finish and/or extreme accuracy, avail yourself of Blanchard *Free Consultation Service.* Another Blanchard Service is *Sample Grinding* on which you pay only the transportation charges.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.





Harrison Oil Coolers Step Up Production Efficiency

On hydraulic presses and a wide variety of other industrial applications, Harrison Oil Coolers increase operating efficiency by maintaining oil temperatures within the required range.

Wear is minimized, "down time" reduced. Performance records prove how well Harrison Oil Coolers are engineered to do their job.

Harrison Oil Coolers are compact, efficient, dependable. They are available in types and sizes to meet your particular requirements.

HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

ONE PIECE CORE SPEEDS PRODUCTION—REDUCES COST

Modern core room equipment at Unitcast *saves time* and *cuts cost*... increasing mass production of castings such as this alligator tread for heavy mobile equipment.

As an example, the core for "hollowing out" this tread is made in one unit . . . and *without* wires! This one unit operation definitely reduces handling costs in the production molding department. Also, it assures a perfect core which results in minimum variance in weight between individual castings from same pattern.

Close technical control of the mixture of core sand is another important factor which enables Unitcast to produce such cores. Correct collapsibility of core sand, as the casting cools, assures thousands of castings satisfactory to the high standards of Unitcast quality and uniformity. Consult with Unitcast engineers regarding your next steel casting requirements. Unitcast Corporation, Toledo 9, Ohio.

CHECK CHART

Send us this information with blueprints to get Unitcastings "geared to the job".

1. The end use of the casting.
2. Will it be welded to component part or frame?
3. Physical properties.
4. Subsequent heat treating.
5. Mechanical tolerances.
6. Processing of casting in your shop before assembly.
7. Estimated quantity at one time and total quantity.

UNITCAST CORPORATION

ALLOY AND CARBON ELECTRIC STEEL CASTINGS

Do You Want to . . . ?

- REDUCE REJECTS TO NIL?
- INCREASE OUTPUT 10-1?
- ELIMINATE EXPENSIVE TOOLING?

This IS THE MACHINE THAT CAN DO IT!

PORTER-CABLE *Wet-Belt Surfacer*

THE proof is in performance! Here are some actual production records set by the PORTER-CABLE WET-BELT SURFACER:

On one job, rejects which formerly ran 20%-25% of production were reduced to only 2 in 18 months!

On long aluminum castings, three bearing pads and three supports were each machined simultaneously . . . *ten times faster* than by previous methods!

On work requiring limits of plus .001", minus nothing, the operator faced two parts before another man had finished locking one up in a jig for milling!

You can equal or exceed these results, completing many precision operations freehand, doing others with only the simplest of fixtures. Jobs which you've been doing on millers and shapers can be done faster, better and cheaper by the PORTER-CABLE wet-belt method of machining. Set up these rapid machines on the production line, in assembly departments, tool room, maintenance or pattern shops . . . man them with unskilled operators . . . and watch them uncork bottlenecks! Send for the complete story of the PORTER-CABLE WET-BELT SURFACER.

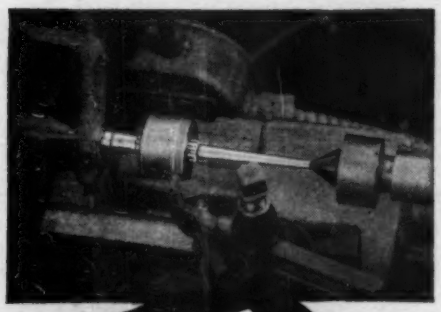
Write for complete production details!

PORTER-CABLE MACHINE COMPANY

2150-6 N. Salina St., Syracuse 8, N. Y.

Eliminate waste motion — cut down elapsed time changing pieces—reduce handling and operator fatigue. More and better production per machine hour makes the *"Knock-Out"* Expanding Mandrel an IDEAL PRODUCTION TOOL.

Ideal for Tool Room too. Only 5 mandrel sizes to handle *all* work with 3/8" to 2½" hole. Eliminates special mandrels — savés hours of machine time.



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ABERDEEN SOUTH DAKOTA

Ask your supplier or mail the coupon today for illustrated bulletin.

K. O. LEE COMPANY,
1118 First Ave. S. E.
Aberdeen, South Dakota

Please send us the illustrated bulletin giving complete details, sizes, etc. on "Knock-Out" expanding Mandrels.

Name_____

Address_____

City_____ State_____

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: April 1 to May 1

TREND INDICATORS

Veterans' Rights

CAUSE FOR DISCHARGE

Willful disobedience of reemployed veterans to employer's instructions as to how to operate a truck, with the result that the truck was damaged, was held to be just cause for discharge. (Pelot v. Schott; USDC Middle Pa.)

REINSTATEMENT ORDERED

An employer who took over the business of another was under obligation to reemploy, on her return from service, a nurse who was with the Army Nurse Corps. The nurse is also entitled to interim compensation in addition to her reinstatement. (Kicinski v. Constable Hook Shipyard; USDC N. J.)

VETERANS NOT ENTITLED TO VACATION

Reemployed veterans are not entitled to recover vacation pay from their employer for the time they were in military service, since the employer had no established rules and practices relating to employees on furlough or leave of absence other than the union contract, and the contract made no such provision. In fact, the contract in question specifically said: "Vacations could be taken only during the current calendar year and that employees . . . are eligible for vacation based on their total service to and including December 31 of the preceding calendar year, excluding any service prior to a quit or discharge." (MacLaughlin v. Union Switch Company; USCE W. Pa.)

REINSTATEMENT ORDERED

One who succeeds to a job vacated by an employee who enters the military service, was properly demoted to his former job, an arbitrator ruled, to provide for reinstatement of a veteran. The replacement was ordered despite the fact that non-veteran had greater seniority, since the non-veteran would never have been placed in the disputed job, regardless of seniority, had the veteran not left to enter the service. (In re arbitration between Goodyear Tire & Rubber Company of Alabama and United, Rubber, Cork, Linoleum, & Plastic Workers of America)

SENIORITY

A reemployed veteran is entitled to restoration of his full seniority even though he had been assigned to another position, because of which he withdrew from the union and waived his seniority. The court found that the withdrawal from the union was temporary rather than absolute and the waiver of seniority exacted from the veteran was conditioned upon his qualifying as a machinist and receiving appointment as such. (Riggle v. Cincinnati Union Terminal; USDC S. Ohio)

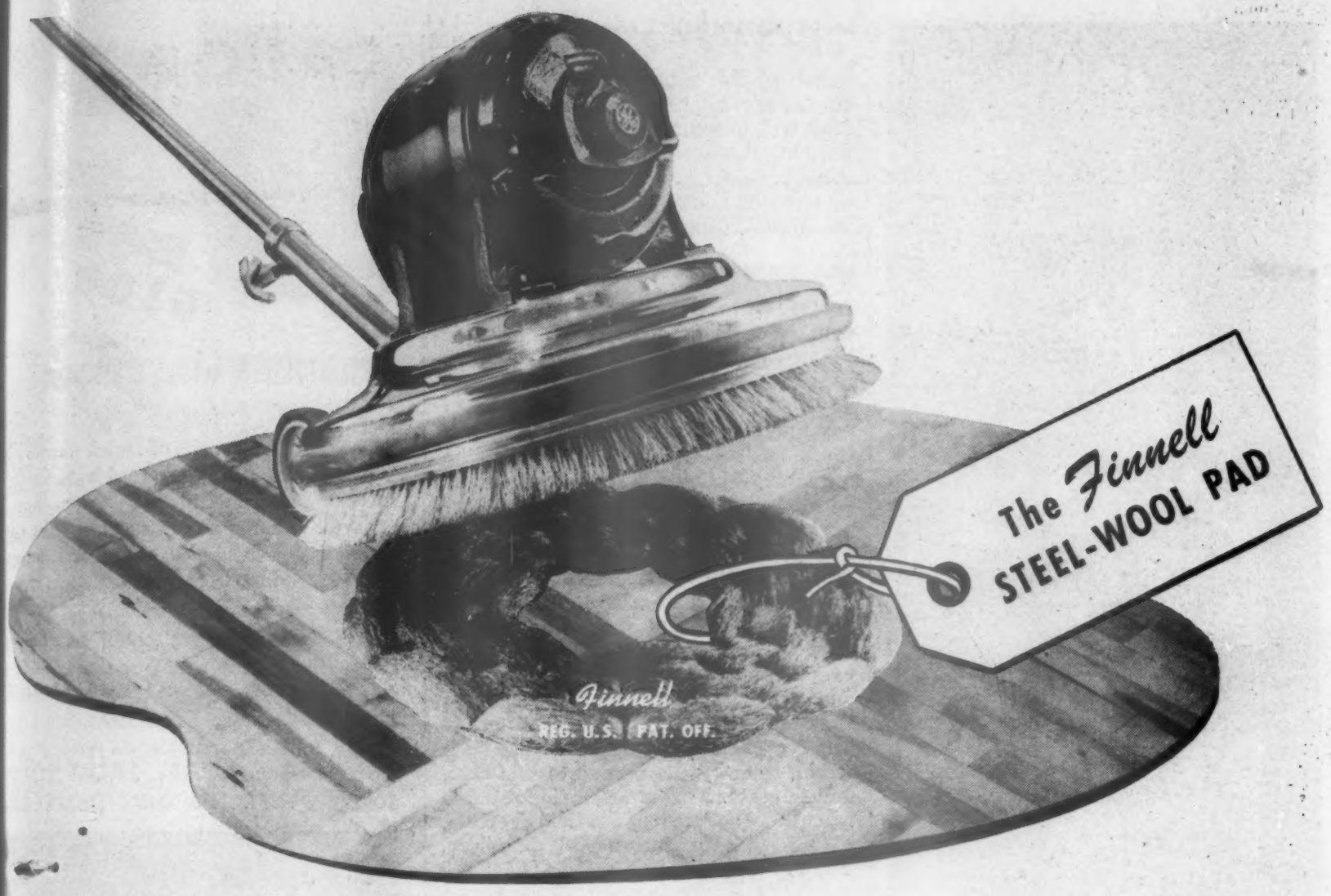
Wage-Hour

WAITING TIME BETWEEN RUNS NOT TIME WORKED

Bus drivers, who worked for an employer under contract with the federal government to collect and deliver mail, cannot claim pay for waiting time between scheduled runs. During such waiting time drivers were free to go anywhere and do whatever they pleased, but were subject to call by the employer. The burden of proof in such cases is upon the employees to prove their case by a fair preponderance of evidence. Each case must rest upon its own facts. "In all situations it becomes necessary for the court to determine whether the employee was engaged to wait or waiting to be engaged." In this instance, the interval was a continuous one of an hour and three-quarters between trains, in which the employee was entirely free to follow his own personal activities. (Gifford v. Chapman; USDC W. Okla.)

OVERTIME FACTOR INCLUDED IN BONUS

A federal district court recently upheld a bonus plan whereby the company set aside every month in a production savings fund a specified percentage of the dollar value of all production which entered the final inspection department. If the money in the fund exceeded the amount which was paid to all the employees during the month in both straight-time and overtime pay, the difference between the fund money and the total payroll was distributed pro rata to each employee. The court held that this type of plan divides the bonus payments into regular and overtime hourly segments in a realistic and mathematically workable manner. "If the bonus distributed to the employees is based on a predetermined percentage of the total earnings (i.e., both straight time and overtime) of the individual employees, no additional overtime need be computed and paid, since such a bonus itself includes the payment of both straight time and overtime." Since the method of distributing the bonus is



It's Welded FOR LONGER WEAR *and* FOR FINER CARE OF WAXED FLOORS

This improved type of construction *triples* the life of the pad by allowing it to wear *evenly* and by preventing shredding and bunching. *Welded construction* gets all the wear out of all the material! And this same feature that is responsible for longer wear also results in finer care. With uniform contact assured, the *Welded Pad* must and does do a finer job faster!

Thus the *Finnell Welded Pad* furthers the economy of steel-wooling—the simplest way to care for waxed floors in between periodic refinishings. In a single operation, steel-wooling dry cleans and polishes waxed floors to new brightness and to a safer, wear-resisting finish.

Finnell Welded Pads are self-adjusting, and can be used on any fibre brush, with any disc-type machine. *Sizes:* 5, 7, 11, 13, 15, 18, and 21-inch. *Grades:* No. 0—*Fine*, for cleaning, polishing, and burnishing. No. 1—*Average*, for cleaning and scrubbing. No. 2—*Coarse*, for use on rough floors. No. 3—*Very Coarse*, for removing paint and varnish.

For consultation or literature on *Finnell Pads, Waxes*, and *Floor-Maintenance Machines*, phone or write nearest *Finnell* branch or Finnell System, Inc., 2506 East St., Elkhart, Ind. Canadian Office: Ottawa, Ont.

Finnell-Processed
WAXES
Finnell-Kote Solid Wax
Finnell Liquid Kote
Finnell Cream Kote
Finnell Paste Wax
Finnell Liquid Wax
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Several Types

FINNELL SYSTEM, INC.
Pioneers and Specialists in
FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

Hillyard Non-Skid Floor Treatments and Economy Maintenance Materials properly care for and make attractive all types of floors in every type of institution . . . give entire satisfaction with less labor. Write for our new "Job Specification" Booklet, it is sent FREE upon request.

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HILLYARD CHEMICAL CO. ST. JOSEPH, MO.

370 TURK ST. SAN FRANCISCO 2, CALIF. 1947 BROADWAY, NEW YORK 23, N. Y.

LABOR DEVELOPMENTS *(continued)*

based on the ratio of each individual employee's total wages (both straight time and overtime) to the total wages paid to all employees for the month, it is not necessary to pay additional overtime on the bonus payments. (Adams v. Macklin Company; USDC E. Mich.)

BELO CONTRACT SUSTAINED

A contract between an employer and oil field workers for a fixed salary for 84 hours' work each week is valid when the contract provided for a basic hourly rate of pay for the first 40 hours of any work week and not less than one and one-half times such basic hourly rate for the remaining 44 hours. Extra overtime was added to the fixed wage when the employees exceeded 84 hours. The employees in this case had no usual work week. In many weeks they worked more than 100 hours, in others less than 30. In about 20 per cent of the work weeks, they worked in excess of 84 hours, for which time they were paid in accordance with the contract on the basis of the specified hourly rate with appropriate overtime. The Belo case has been relied upon by the parties to this case, and the facts here are indistinguishable from those covered by the Belo doctrine. (Walling v. Halliburton Oil Company, USSC)

COMPUTATION OF OVERTIME

An agreement whereby the employer promises to incorporate into the weekly base rate of foremen the sum regularly paid for fixed overtime work, requires that this new, higher rate be paid to all foremen, including those who never worked overtime. The employer's agreement makes no distinction among foremen, and the union insists that it would never have agreed to establishment of two rates of pay for employees in same classification. The employer does not have the right unilaterally to change job classifications. He may, however, require those foremen who have not performed overtime work in the past to perform such work in the future. The collective bargaining agreement itself did not contain any distinction between two types of foremen. Neither did the directive (which incorporated the agreement on wages) distinguish between two categories of foremen, nor did it indicate that some foremen are to receive one rate while others are to receive a different rate. Although the intent of the company may have been to increase the base rate of one category of foremen only—and though this intent may have been reasonable and legitimate—the fact remains that no such distinction was discussed, agreed upon by the union, or inserted in the directive. (In re arbitration between San Diego Gas & Electric Company and International Brotherhood of Electrical Workers)

WORKING FOREMAN NOT EXEMPT

A working foreman employed by an ink company was held not to be an "ex-

Ventilated
WORK
GLOVES

COMFORT with Safety

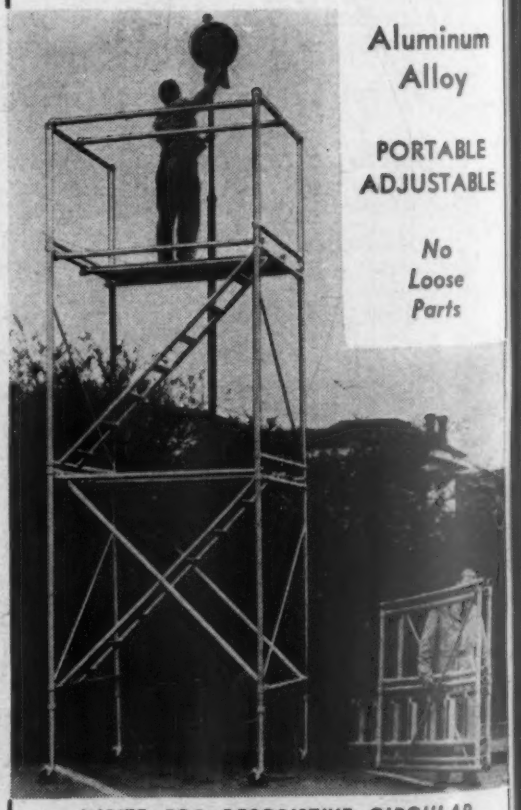
The palms and fingers of Hood *Ventilated* Work Gloves are impregnated with tough, specially bonded Neoprene. They're bears for wear and the sturdy cotton backs are *ventilated* by thousands of natural pores which let air in to keep working hands more comfortable.

Save the working surfaces of *vital* hands in your industry from the penetrating action of tough, hard, sharp, abrasive materials. Hood's half-century of experience in making quality rubber goods assures *better* work gloves for you. ORDER FROM YOUR JOBBER NOW. PROMPT DELIVERY.

-HOOD-

HOOD RUBBER CO., WATERTOWN, MASS.
A Division of the B. F. Goodrich Company

"How we saved $400 on a single job"
SAYS MR. X—BY USING AN
UP-RIGHT SCAFFOLD



WRITE FOR DESCRIPTIVE CIRCULAR
UP-RIGHT SCAFFOLDS
BANK OF AMERICA BLDG.
BERKELEY 4, CALIFORNIA

Too Busy on Wire Maintenance to Read This?

If wire failures are a constant headache due to high ambient temperatures, overloads, deterioration caused by moisture, oil, grease, corrosive fumes and age . . . call in a Rockbestos engineer. He *can* and *will* solve your problem.

He'll give you the facts about Rockbestos A.V.C. wires and cables that guarantee long and trouble-free service under the toughest operating conditions because they are *permanently insulated* with heat and flame-resistant asbestos. This ageless insulator won't bake brittle, crack or flow in temperatures up to 230° F.

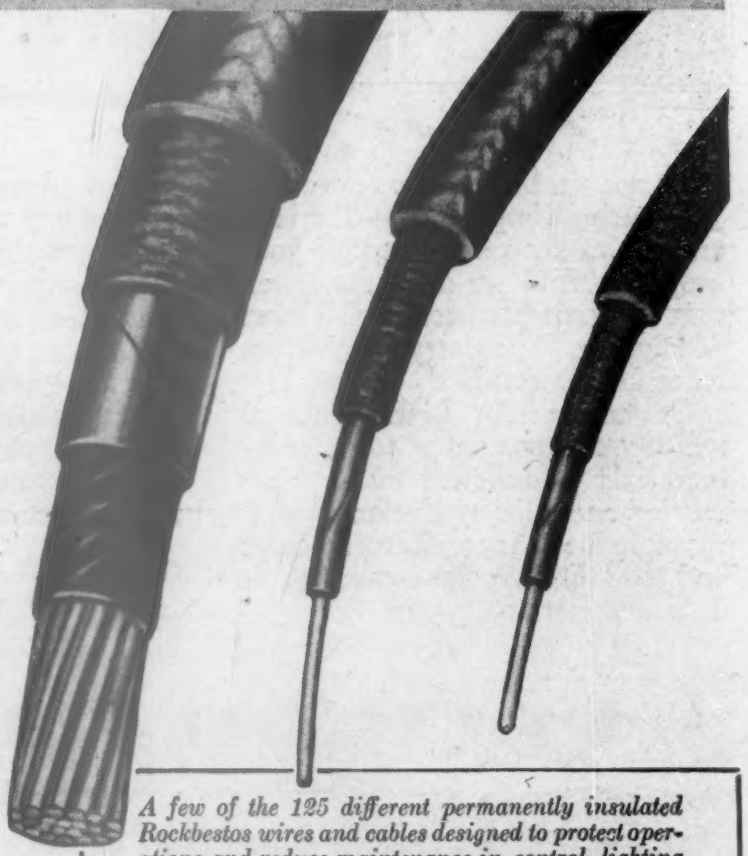
Hot spots shorten wire life and cause failures. Protect circuits around furnaces, pump rooms, boilers, kilns, soaking pits, steam tunnels and heat-exposed ducts with Rockbestos A.V.C. It pays its way by eliminating repeated re-wiring.

125 different standard Rockbestos wires and cables in 300 to 5000 volt ratings. Write for catalog and samples — or, if you prefer, the Rockbestos engineer nearest you will call with them.

ROCKBESTOS PRODUCTS CORPORATION
191 Nicoll St., New Haven 4, Conn.

ROCKBESTOS A.V.C.

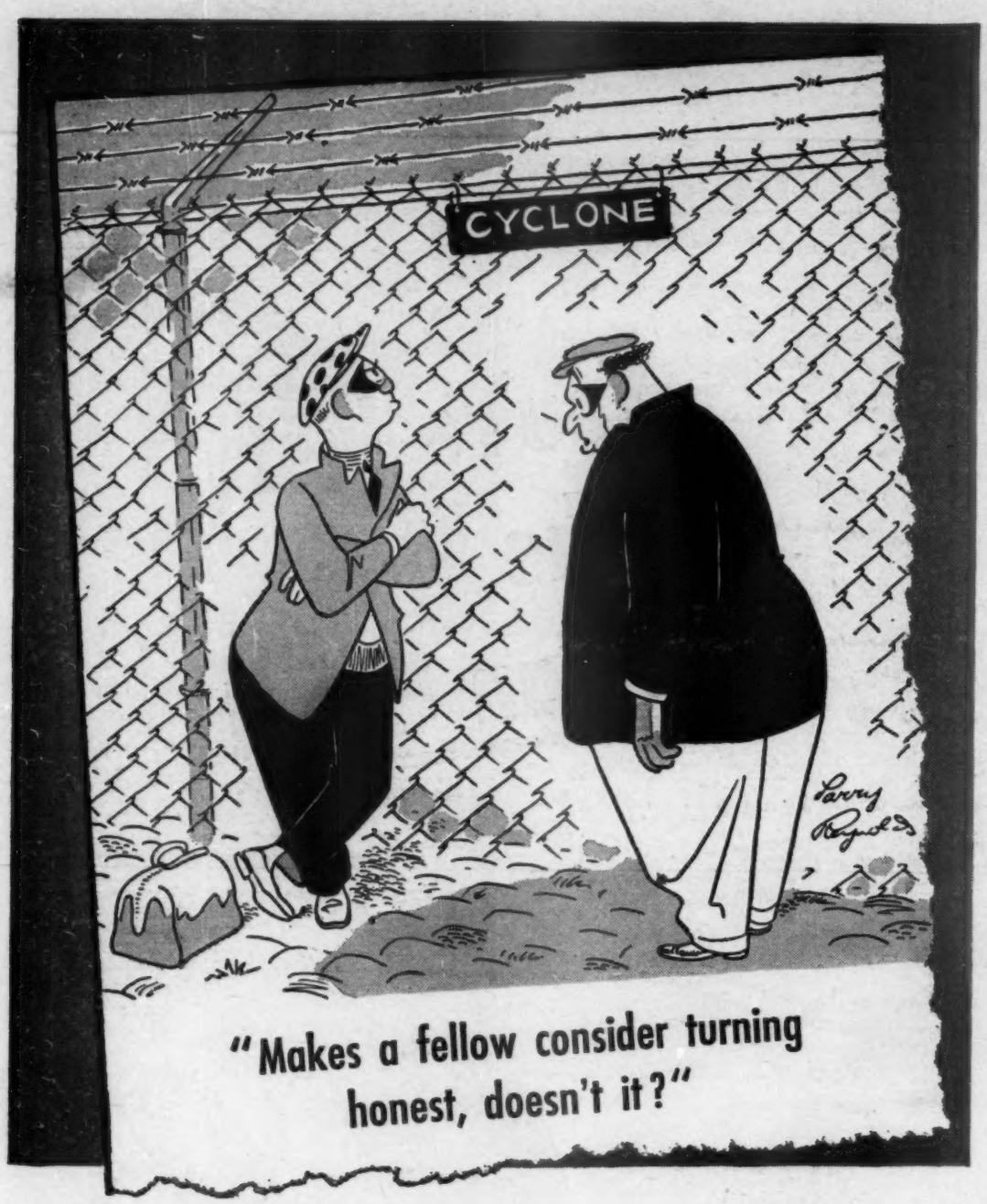
The Wire with Permanent Insulation



A few of the 125 different permanently insulated Rockbestos wires and cables designed to protect operations and reduce maintenance in control, lighting and power circuits. From left to right:

Type AVA 600 Volt Rockbestos A.V.C. Power Cable*
Type AVA 600 Volt Rockbestos A.V.C. Boiler Room Wire
Type AVB 600 Volt Rockbestos A.V.C. Switchboard Wire
*Other single and multi-conductor cables up to 5000 volt rating.

NEW YORK · BUFFALO · CLEVELAND · PITTSBURGH · DETROIT · CHICAGO · ST. LOUIS
LOS ANGELES · SAN FRANCISCO · SEATTLE · PORTLAND, ORE.



"Makes a fellow consider turning honest, doesn't it?"

IT'S not our business to reform despairing desperadoes—but it *is* our job to keep intruders off your property. And we do this so well that Cyclone has become the most widely used property protection fence in the world.

Cyclone Chain Link Fence is sturdily constructed of top-quality materials — designed for efficient service, and built by Cyclone craftsmanship into a fence that stays taut and true through the years. And it is firmly installed — by Cyclone's own factory-trained crews — to withstand the continued buffetings of wind and weather.

To get the benefits of Cyclone Fence protection for your own plant, send in the coupon below. It will bring you a booklet describing the 14 types of U·S·S Cyclone Fence available. Or call on one of our expert engineers to assist you in your planning. There is no obligation, of course.

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United States Steel Export Company, New York

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ecutive" or "administrative" employee exempt from the Act. In his action to recover overtime, the working foreman, upon whom the burden of proof lies, submitted tabulations to show that he did work in various capacities besides that of a supervisory employee, and that he performed 623½ hours beyond the 40-hour week. His evidence also indicated that over 20 per cent of his time was spent in manual labor. The evidence of the working foreman was given by two executives, one of whom was the immediate superior of the employee. Working foreman was not an exempt employee either in an executive of administrative class, although he performed many functions which were of that character, and is therefore entitled to recover. (De Jong v. Sleight Metallic Ink Company; USDC E. Pa.)

COMBINATION PAYROLL CLERK AND PERSONNEL MANAGER NOT EXEMPT

A combination job of payroll clerk and personnel manager cannot be considered exempt as an administrative employee where he performs non-exempt work not incidental to his administrative duties. The Wage-Hour Division has consistently taken the position that "performance by an otherwise qualified administrative employee of any [illegible] exempt work which is not incidental to the performance of the employee's administrative duties, will defeat the exemption in any work week in which such work is performed." Accordingly, even though the duties of "personnel manager" were such that they met the requirements of the exemption, the performance of any of the routine clerical duties of "payroll clerk" (i.e., compilation of the payroll, handing out payroll checks, preparation of payroll recapitulations, preparation of the payroll register computation of payroll taxes), which were not incidental to the performance of the exempt administrative work, would defeat the exemption. (Opinion Letter by F. Granville Grimes, Ass't to Deputy Administrator)

LABOR MANAGEMENT RELATIONS

*MANAGEMENT'S RIGHT TO SPEAK FREELY

A recent decision issued by the National Labor Relations Board reaffirms management's right to speak freely concerning unions, even though statements were made to the effect that "there was no outside organization going to run this shop" or "if the employee didn't like his job, why didn't he quit." Such statements made heretofore would have definitely been held to be an unfair labor practice. While it is true that these statements indicate an anti-union attitude, the board has taken the position that they are not *coercive*.

The board even went so far as to differ

* In this classification, items marked with an asterisk also are considered to be trend indicators.

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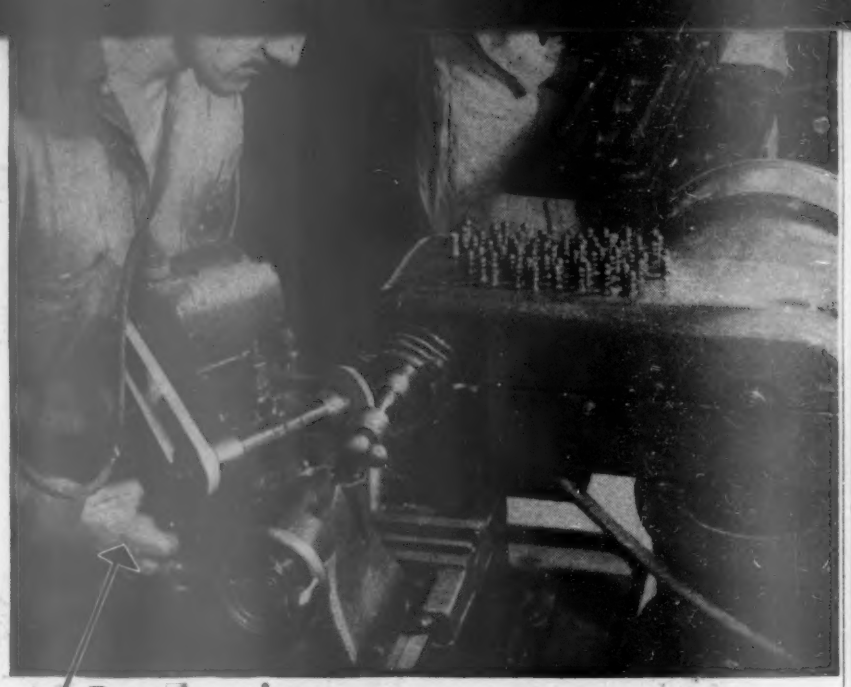

Production — Curlemont Corp., Chicago, Illinois, made out on poppet-valve production with line of No. 44 Dumores mounted on lathes, after 8 shops with more expensive equipment failed.

Toolroom — Zagar Tool Co., Cleveland, Ohio uses No. 7 Dumore on Brown and Sharpe Surface Grinder in place of standard head, to provide high-speed accuracy required in broach grinding.

Maintenance — Northwest Airlines, St. Paul Shops, extends life of parts by chrome-plating worn surfaces and regrinding to exact size with high-precision Dumore No. 5 mounted in lathe compound.

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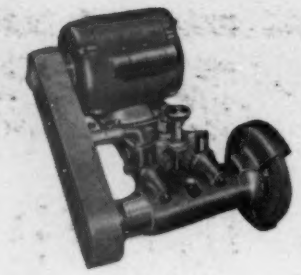
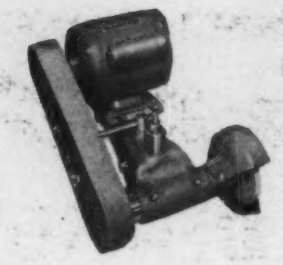


No. 12

— 1 HP; speeds 2800 to 7750 rpm.; wheel sizes — 3" to 8"; for external work and internal to 24" depths.



No. 77

— ½ HP; speeds 3400 to 13,800 rpm.; wheel sizes — 1" to 6"; for external work and internal to 18" depths.

No. 7

— ¾ HP; speeds 4200 to 29,300 rpm; wheel sizes — ⅛" to 5"; for external work and internal to 18" depths.

No. 5

—½ HP; speeds 4600 to 42,500 rpm.; wheel sizes — ⅛" to 5 "; for external work and internal to 18" depth.

No. 44

—¼ HP; speeds 6600 to 38,500 rpm.; wheel sizes — ⅛" to 3".

No. 11

— ⅕ HP; speeds 6900 to 30,000 rpm.; wheel sizes — ⅛" to 3".

No. 14

—1/14 HP; speeds 10,000 and 22,500 rpm.; wheel sizes ⅛" to 2"

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- Dumores mount on any basic machine tool, converting it to a precision grinder.
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- Dumores serve as precision, high-speed work-heads on many special grinding machines.
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No. 10 HG

— 1/10 HP; speed—22,000 rpm.; ⅛" capacity chuck or Jacobs No. 0 Chuck, 0 to ⅛" capacity.

No. 9 HG

— ¼ HP; speed — 15,500 rpm.; ¼" capacity chuck and extension arbor.

Duplex

— 1/14 HP; speed—17,000 rpm.; ¼" capacity chuck with ⅛" and 3/32" adapters; flexible shaft attachment.

Plus

Sensitive Drill

— 1/30 HP; speeds 2000 to 15,000 rpm.; Jacobs No. 0 Chuck, 0 to ⅛" capacity. With foot rheostat to control speed.

No. 2 Flexible Shaft Tool

— 1/15 HP; speeds 500 to 10,000 rpm.; Jacobs No. 0 Chuck, 0 to ⅛" capacity. With foot rheostat to control speed.

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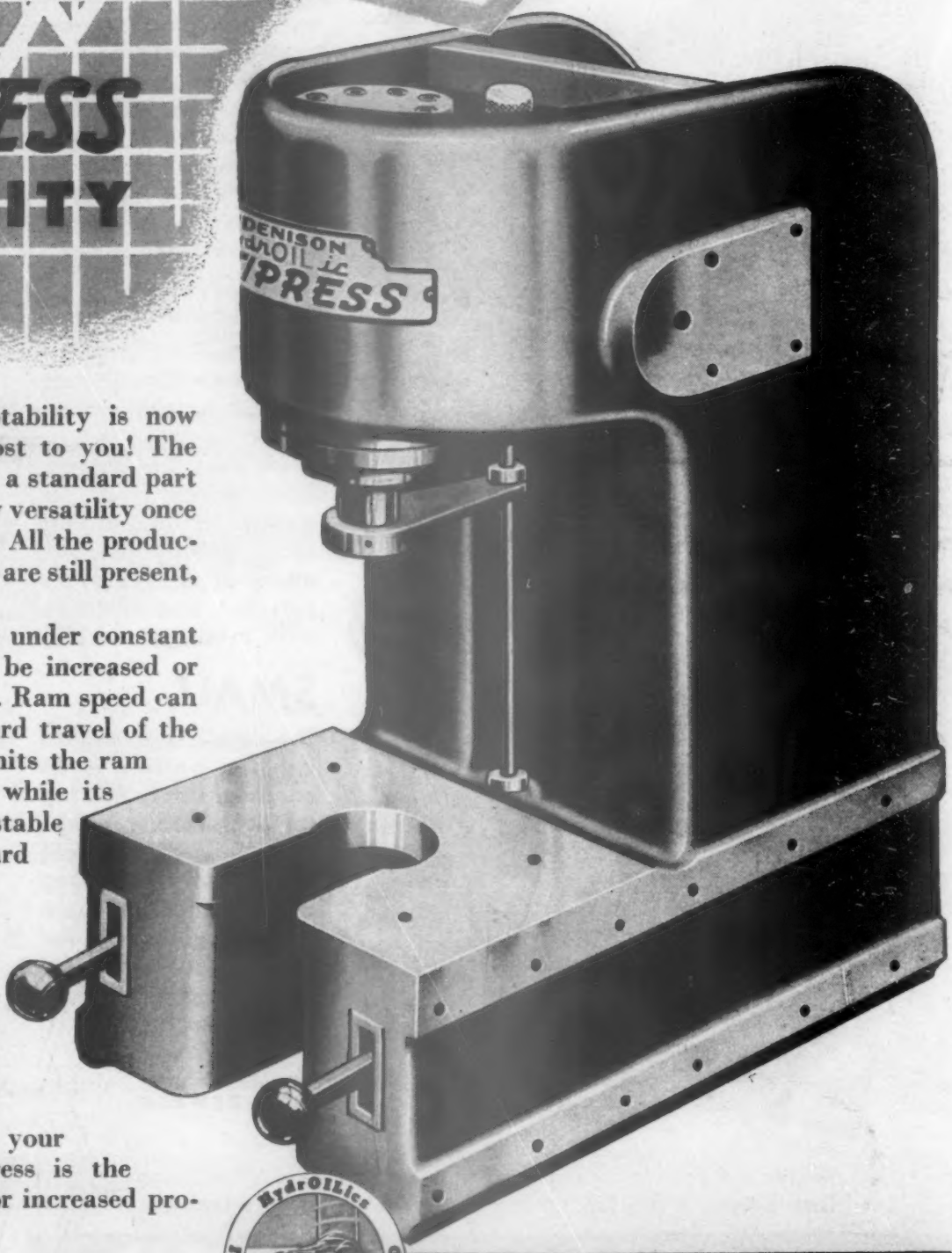

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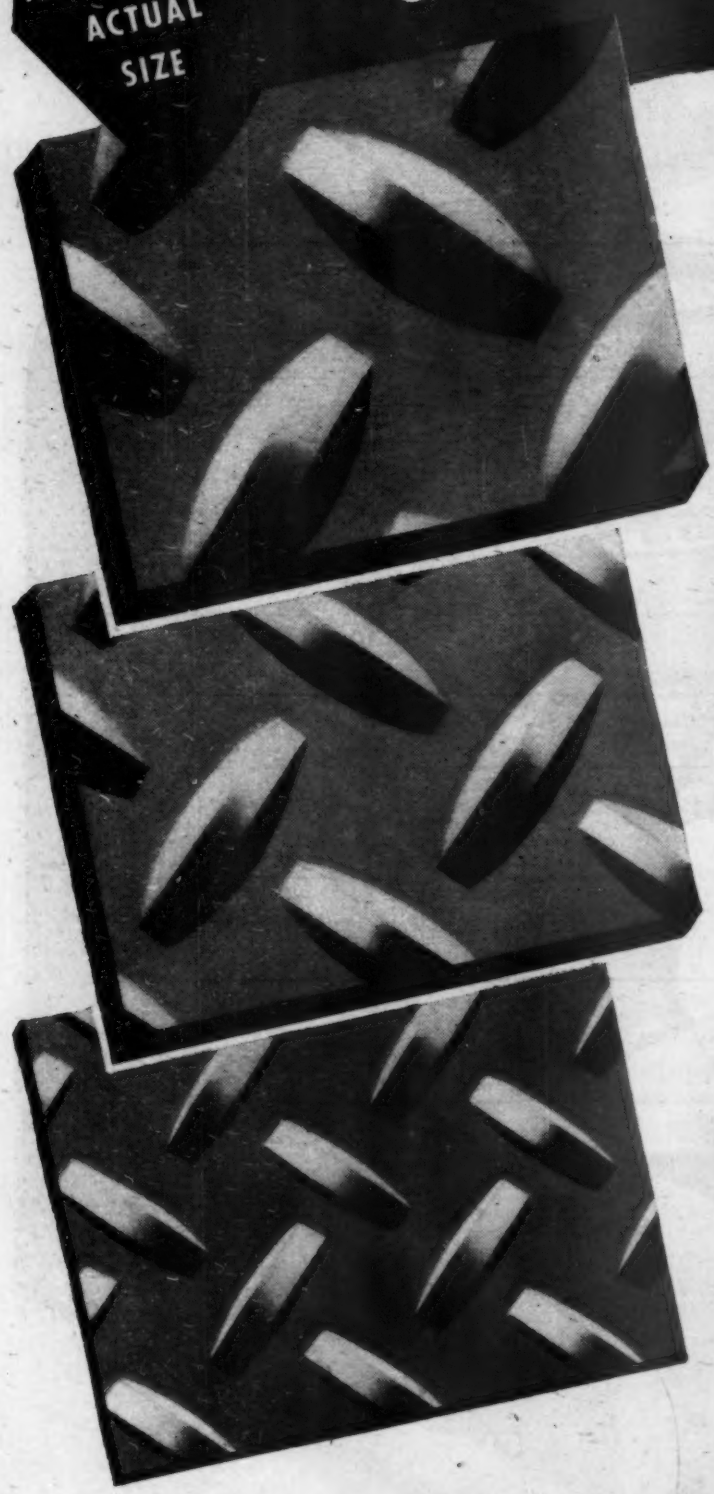

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with its counsel on the question of disciplinary action. A particular shop rule provided that it shall be sufficient ground for disciplinary action, including discharge, "to distribute or circulate literature, petitions, or written or printed matter of any description on company premises." The board could find no *evidence* that the rule was *discriminatorily* adopted or enforced, or that enforcement of the rule is improper under the Act. (General Motors Corp., Rochester Products Div., and United Electrical Workers; NLRB)

*EMPLOYER'S RIGHT TO INSIST UPON AN ELECTION

An employer who honestly doubts that the union demanding recognition really enjoys a majority status, may now insist upon an election by the National Labor Relations Board even though the union presents him with a card check as evidence of the fact that it has almost 100 per cent membership and there is no rival union. The board has recently held that such insistence by the employer is not considered bargaining in bad faith.

Before directing an election, the board must be convinced that the employer really entertained an honest doubt as to whether a majority of his employees desired to be represented by the union, and that the employer's insistence upon a board-conducted election was not for the purpose of avoiding his obligation to bargain collectively with the designated representative. However, the employer's skepticism as to whether the proffered membership cards reflected the desires of a majority of his employees cannot be used as a basis for refusal to bargain. The employer had agreed to be bound by the results of the consent election and did not know that the board could not conduct such an election quickly. The board has pointed out in its decision that the conclusion reached in this case does not mean that an employer may always demand an election or certification when faced with a demand for bargaining rights by a representative claiming to represent a majority of his employees. His refusal to accept membership cards as proof of a majority designation, in the presence of circumstances indicating bad faith, would be in violation of the Wagner Act. If the majority is present, the employer is obligated to bargain with the representative of the majority of the employees "subject to the possibility that a particular employer may, in good faith, ask for reasonable proof of the representative's asserted majority status." (Roanoke Public Warehouse, NLRB)

*EMPLOYER MAY REQUEST CERTIFICATION

The board's certification of a union as the appropriate collective bargaining agency will not bar the employer from requesting another certification by the board within a year's time, when substantial doubt has arisen as to whether or not the certified union really represents a majority of the employees. The board has found that "substantial doubt"

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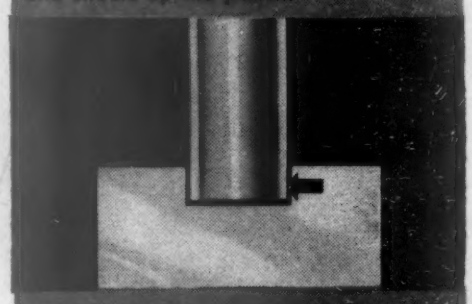

3. The space between the die and punch determines wall thickness. The external design features are incorporated in the die, the internal in the punch.

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LABOR DEVELOPMENTS *(continued)*

has arisen when the certified union disaffiliated itself with its parent organization—CIO—and became affiliated with AFL. As a result of a regular membership meeting, at which a motion was unanimously passed to disaffiliate from CIO, the executive board of the local met and approved affiliation with AFL. A special membership meeting was soon held at which formal resolutions of disaffiliation from CIO and of affiliation with AFL were unanimously approved. Thereupon, the employees advised the employer that the CIO union constituted the authorized representative of the employees. When the AFL union requested the employer to recognize it as the duly designative representatives, the employer, confronted with conflicting representation claims, exercised his right to request an investigation and certification of representatives under those circumstances. (Jasper Wood Products Company, Inc., and Furniture & Veneer Workers Local Union No. 331; Upholsters' International Union of North America (AFL), and United Furniture Workers of America Local No. 331, NLRB)

***MANAGEMENT'S DUTY TO DISCUSS CHANGES IN WORK WEEK WITH UNION**

A contract clause which states that, "Before any changes are made in the established hours of work of a normal work for each department, they will be discussed with the union," requires some discussion with the union preliminary to a 2-day shutdown. Whereas, the first such occasion may be excused, when it arose again during the two weeks following, preliminary explanations should have been made. Although the language of the above quoted provision could be interpreted as referring exclusively to starting times of shift operations, length of workday, when the lunch period shall be taken, and the like, and not to the necessity of a temporary shutdown as is here involved, it seems more reasonable not to construe the section narrowly because the company binds itself to nothing more than the necessity for discussing its contemplated action with the union prior to taking such action. (In re arbitration between Timken-Detroit Axle Company and International Union, United Automobile, Aircraft & Agricultural Implement Workers of America)

***DISCHARGE HELD DISCRIMINATORY**

In one case, the National Labor Relations Board held discriminatory the discharge of an employee, *who happened to be an active member of the union,* when the employee was guilty of draining a small quantity of gasoline. This, the board held, was not the controlling reason, even though it is the reason believed by the employee to have caused his discharge.

The board found that:

1. The employee's work performance had been reasonably satisfactory throughout his approximately 8 years' tenure with the employer.

2. The employer failed to give due

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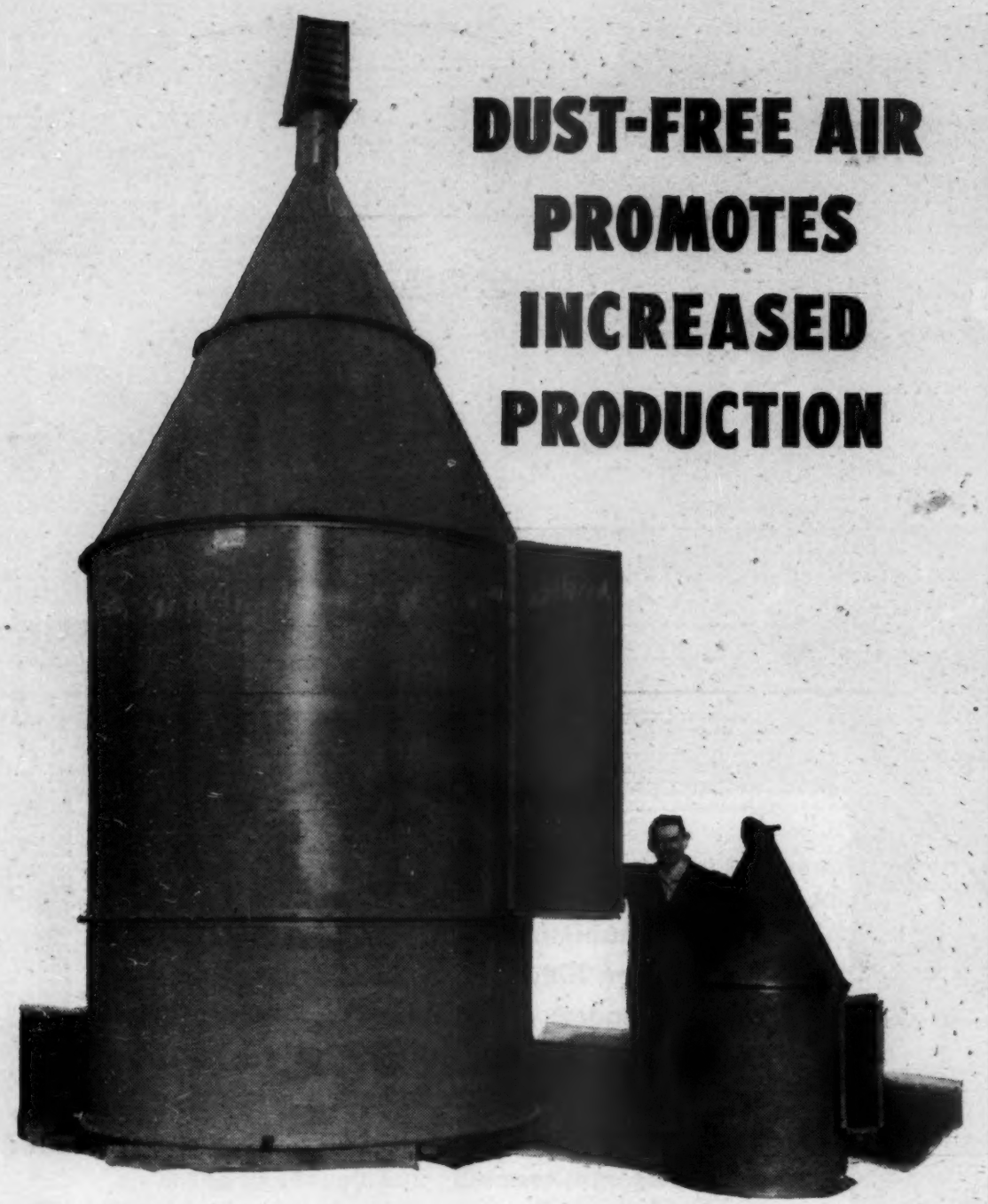

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publicity to any rule prohibiting employees from appropriating small quantities of gasoline which remained in the trucks after completion of delivery to consignees.

3. The draining of gasoline from the returned truck by employees was a common practice of long standing, knowingly permitted by the employer.

4. No other driver had been discharged or otherwise disciplined for engaging in this practice.

5. The employee was discharged during the union's organizational campaign.

6. The employer had openly demonstrated his antipathy toward the union and the organizational efforts of its employees.

7. The employer knew of the employee's union membership and activities, had threatened to take discriminatory action against union members, and had singled out the employee as one of the union leaders. (Ford Bros. v. NLRB)

***REINSTATEMENT ORDERED**

The New Jersey Court of Errors and Appeals held that an employee must be reinstated when his discharge was not in conformity with the requirements of the contract.

The case involved the discharge of an employee for failure to report all fares collected. Under the contract, an employee could not be discharged without a fair and impartial investigation, or a complaint in writing signed by the complainant, with his address, and if the complainant be in the employ of the employer—that he be present at the hearing. Because the employee was discharged without being told who the complainant was, the court ordered his reinstatement. The fact that the spotter was an employee of an outside company, hired to do the spotting, did not excuse the company from its contractual duty.

The employee was discharged without being confronted by the person making the complaint against him and without opportunity to cross-examine his accuser. The court rejected the company's claim that the spotter was not its employee and that in any event it could not produce the spotter. *The contract calls for no such limited construction.* Collective bargaining agreements are intended to secure fair dealings between the parties, and must be respected. (Brotherhood of Trainmen v. Hill Bros. Company, New Jersey Court of Errors and Appeals)

Under a contract providing that permanent layoffs shall be made on the basis of efficiency and length of service, the latter to govern when the elements are relatively equal, reinstatement was ordered with full back pay for all time lost, because employees were given no knowledge of the plan of terminating employment.

Evidence indicated that (1) length of service was not considered in determining the termination, and (2) employees were given no knowledge of the plan to

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test their efficiency, a knowledge to which they were entitled in view of their long service. In determining the question of efficiency, length of service would have entitled the employee whose efficiency was questioned to at least some knowledge of the plan of testing his efficiency, in order that the employee might keep some record of the production of which he was capable.

The contract merely provided that management had the right to *suspend* or *discharge* an employee for proper cause or to lay off employees for lack of work or for any other legitimate reason. The contract being silent as to what constitutes "proper cause" for dismissal, the arbitrator must translate those terms in the light of the common experience.

***WAGE INCREASES MAY CONSTITUTE INTERFERENCE**

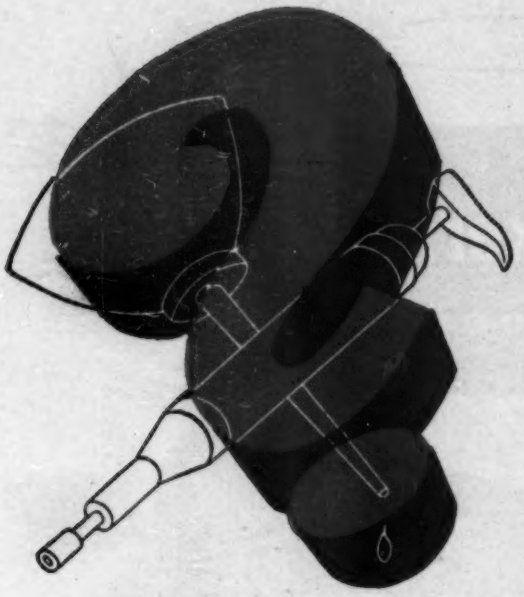
The latest decision of the board on the subject of wage increases warns that offers by management of wage increases may constitute interference, when the purpose was to cause employees to accept or reject a bargaining representative. Thus, the granting of a wage increase, decided on some time in the past, but first offered some 3 days after the union had sought a conference and announced 2 days before an election directed by the board, constitutes unlawful interference. Similarly, an agreement with an inside union, crediting it with securing the wage increase, which was granted shortly after signing the agreement, is also a form of interference.

The granting of increases as such is not unlawful. The board reasoned that the Wagner Act forbids management to utilize its economic power in any manner for the purpose of discouraging employees from becoming or remaining members of a labor organization, or interfering with their selection of bargaining representatives.

Despite the recent tendencies by the board to allow management to speak and circularize freely against unions, management may not offer wage increases, if in such offer an unlawful purpose may be read. The burden of disproving that the offer was unlawful is upon management. (Hudson Hosiery Company and American Federation of Hosiery Workers, NLRB)

***EMPLOYEES ENTITLED TO SOME INCREASE**

Employees of a textile company are entitled to a 10-cent general wage increase which has been granted by comparable firms in area, despite fact that company is currently operating at a loss. Since the first agreement between the parties, signed in March, 1945, the provision in the agreement, and particularly the wage provisions, have been similar to those in other agreements with the Northern cotton textile industry. In granting wage increases and in making retroactive payments, the company has established a pattern of following the increases granted generally throughout the Northern cotton and rayon industry. As a



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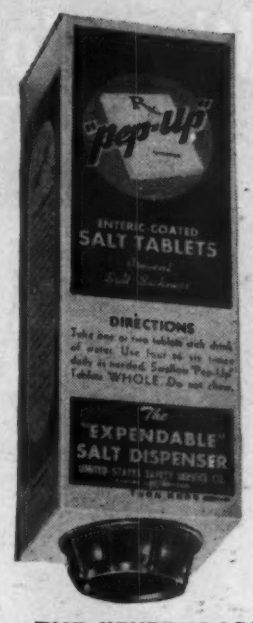

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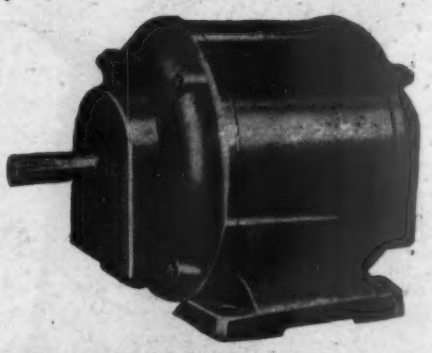

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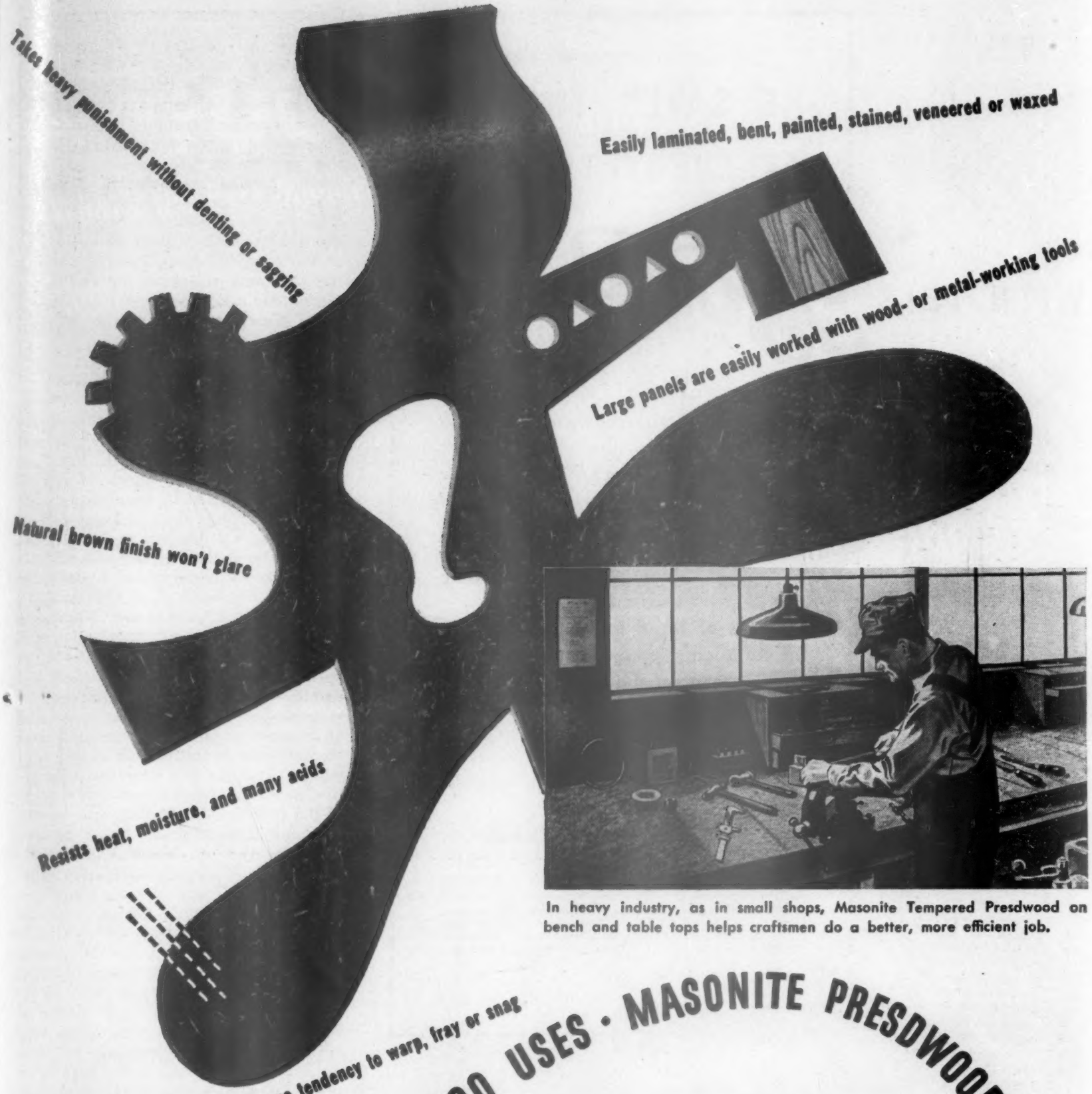
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In heavy industry, as in small shops, Masonite Tempered Presdwood on bench and table tops helps craftsmen do a better, more efficient job.

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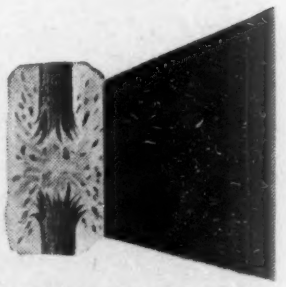

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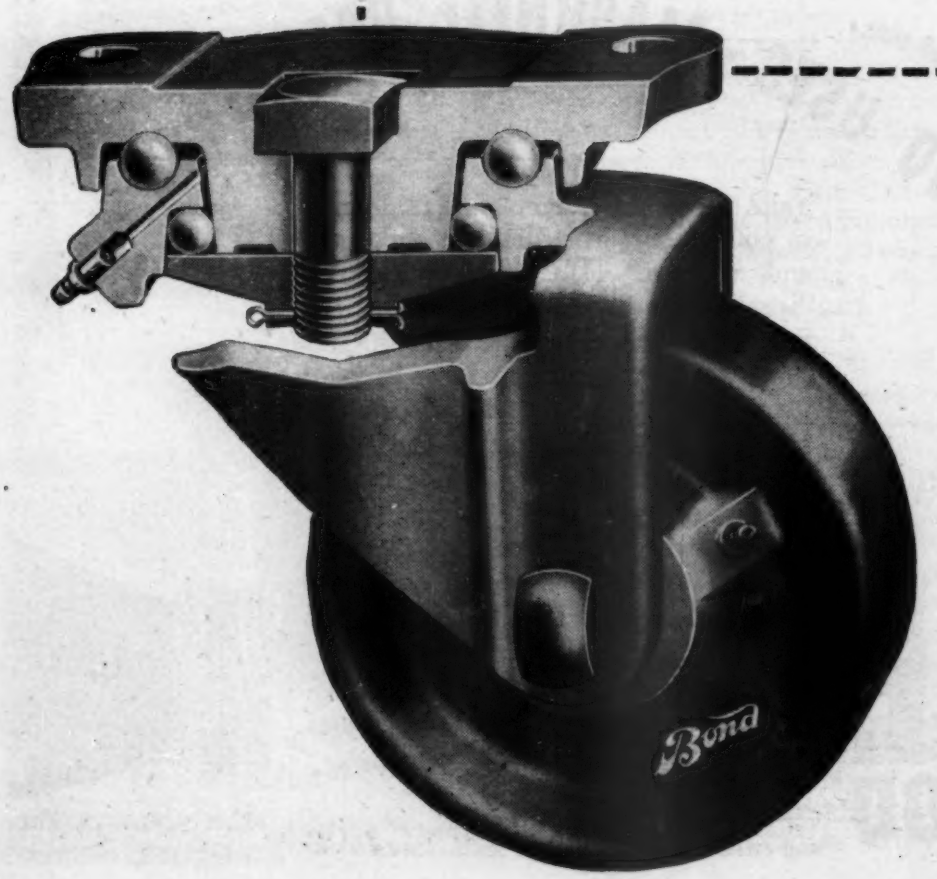

basis for his award, the arbitrator reviewed the similarity between the wage revision clause in the agreement and that in other agreements, a similarity which must be presumed to have been appreciated by the company at the time the agreement was signed. Also the "labor market" considerations are of great importance—employees in New England who presumably have the same general types of skills as the employees of the company have had increases of the sort now requested by the union. (In re arbitration between International Braid Company and Textile Workers Unions of America)

*LONG-STANDING WASH-UP PRACTICE CONSIDERED A BENEFIT

Under a collective bargaining agreement which provided that "all present benefits shall continue in full force and effect," employees in specified departments are entitled to continue to wash up and to change their clothes on company time, where such wash-up practice is of long standing and was initiated and approved by department heads. The evidence disclosed that the wash-up practice had existed in one department for approximately 16 years and in another department for at least the entire period of the war, if not longer. The employer's claim that top management was unaware of this practice at the time of contract negotiation is invalid, since the employer in stating that he did nothing to eliminate this practice, admitted that even top management was aware of the practice. In addition, the admission that these practices were initiated and approved by department heads is sufficient to bind the employer in so far as the subject employees are concerned. The employer should not be permitted to evade his obligation by seeking to deny the authority of his department heads. The arbitrator's award provided that only those employees who in the past have actually changed clothes or washed their hands on company time will be permitted to continue to do so until the expiration of the present contract. Employees, who in the past, have not washed or changed their clothes on company time shall not now be permitted to do so. (In re arbitration between Namm's, Inc., and United Retail, Wholesale & Department Store Union, Department Store Employees' Union, Local 1250)

*UNION MAY PRESENT GRIEVANCES WITHOUT SPECIFIC AUTHORITY OF THE EMPLOYEES

While most grievances may not be presented without the specific authority of the employees (such as those involving discharge or promotion), certain grievances which are not personal in their nature and which involve the whole of the bargaining unit, and where authority to carry the grievance forward is easily read out of the facts and circumstances of the case, the union does have the authority in its representative capacity to originate the grievance and carry it through to final determination, and the

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In food processing plants, where absolute cleanliness and brightness are the rule, a high percentage of maintenance men have standardized on good aluminum paint. With reason, for aluminum is friendly to food, easy to clean, sanitary, and reflective—offers lasting resistance to heat, steam, and moisture. Its high hiding power, durability and good appearance make it the favorite of industrial maintenance men In all kinds of plants . . .

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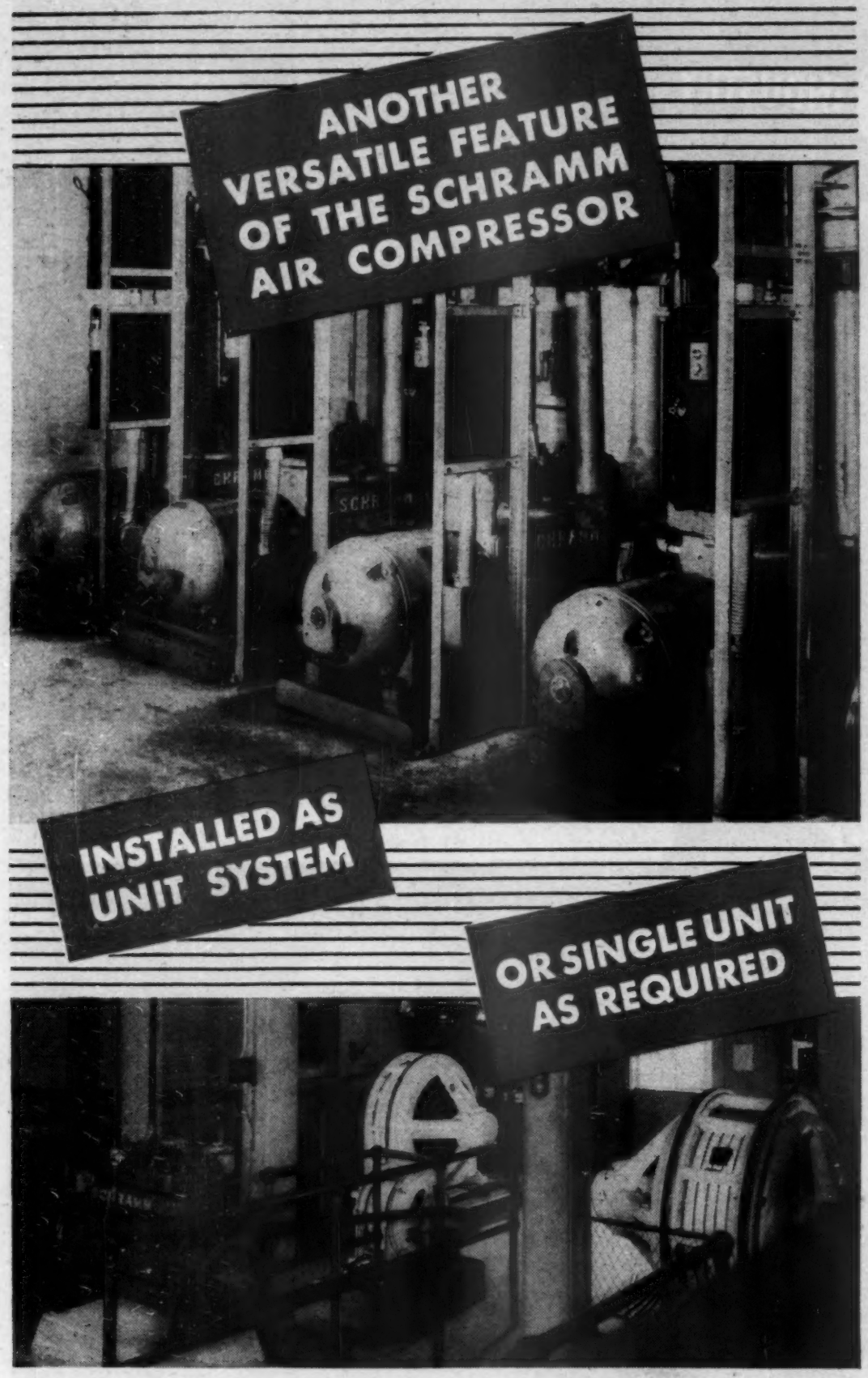

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employees are bound by whatever settlement is reached.

As to the contract itself, it is true that certain phrases in the grievance procedure seem to apply solely to individually authorized grievances. However, industrial practice recognizes the fact that certain types of grievances involving conflicting interpretations of contractual provisions are frequently brought by union representatives in behalf of the entire membership. (In re arbitration between Timken-Detroit Axle Company and International Union, United Automobile, Aircraft, & Agricultural Implement Workers of America)

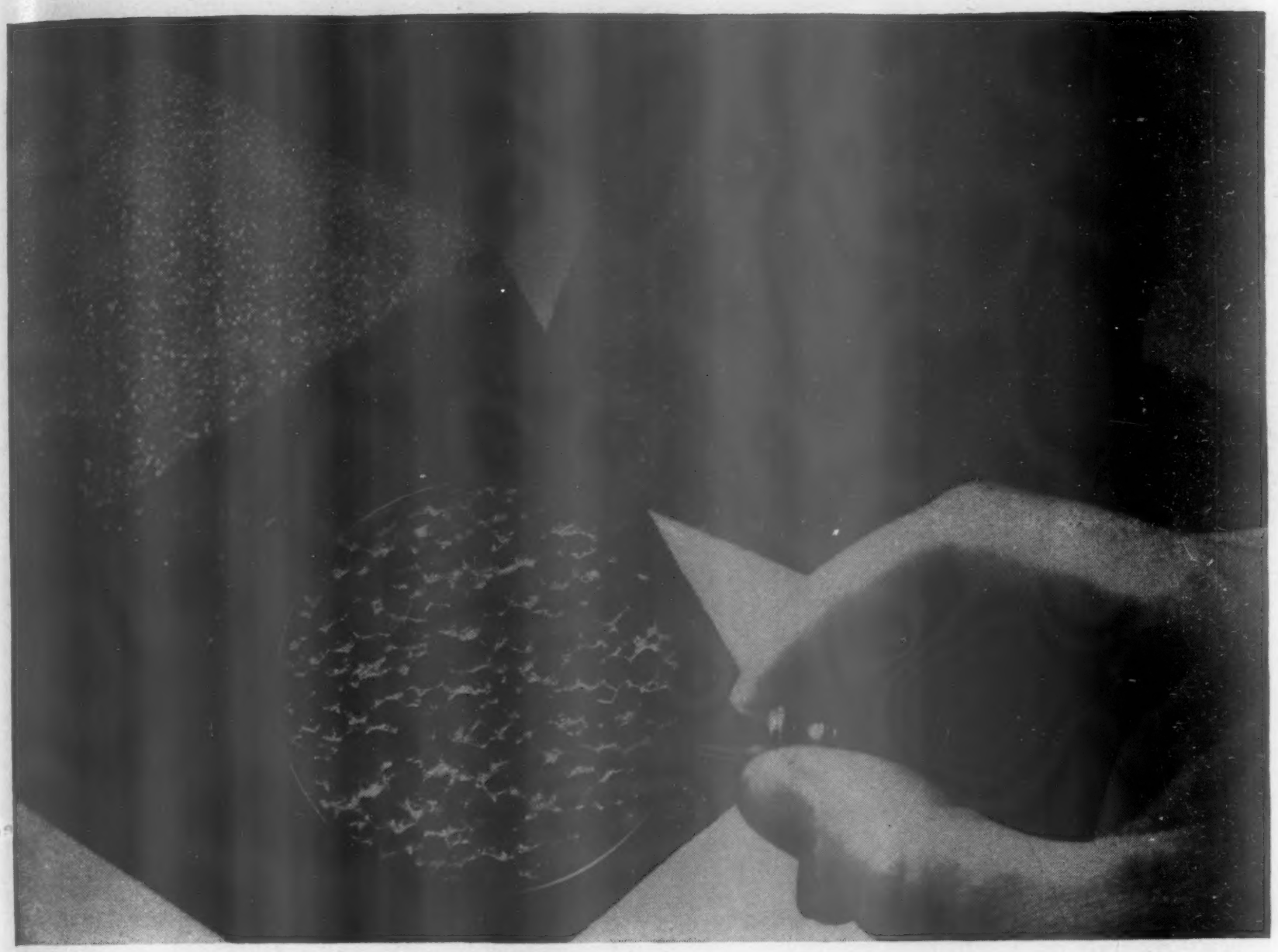
***UNION MAY NOT COMPEL COMPANY TO VIOLATE THE NLRA**

Although the union had a contract with the employer for 2 years, the fact that for the following 7 years no attempt was made by the union to secure a new contract, the court held that the union, by its neglect, lost its rights as bargaining agent. The union, under these circumstances, may not picket the plant of the company or cause third parties to breach their contracts with company in an effort to compel the company, which has no dispute with its employees, to sign a closed-shop contract with the union, since the company thereby would violate the National Labor Relations Act. (Chattanooga Company v. Sheet Metal Workers, Tennessee Chancery Court, Hamilton County)

***UNION'S DUTY DURING ILLEGITIMATE STRIKE**

Where a union engages in an illegitimate strike, violating its contract, which provides a grievance procedure, including arbitration, and which bans strikes over disputes that can be settled through such procedure, the union has the duty to have other employees, particularly union representatives, do the work that the strikers have wrongfully refused to perform. An employee has the right to refuse to incur an undue health hazard. However, in this case the crane operators' refusal to pour any heats even though sodium fluoride were not used, unless supervision agreed that night to discontinue its use in the future, was not a mere refusal to incur an undue health hazard. They stopped work in order to coerce an agreement as to the future. The grievance procedure, as set forth in the contract, gave the umpire jurisdiction over disciplinary penalties imposed for refusal to work or obey orders, and authority to determine whether the order disobeyed involved such a health hazard as to justify the disobedience.

The strikers should have been plainly told by the union that they could not refuse to pour heats on which fluoride was not used. And the only way to make such instructions meaningful is to have other employees do the work when the instructions are not heeded. (In re arbitration between Ford Motor Company and United Automobile, Aircraft, & Agricultural Implement Workers)



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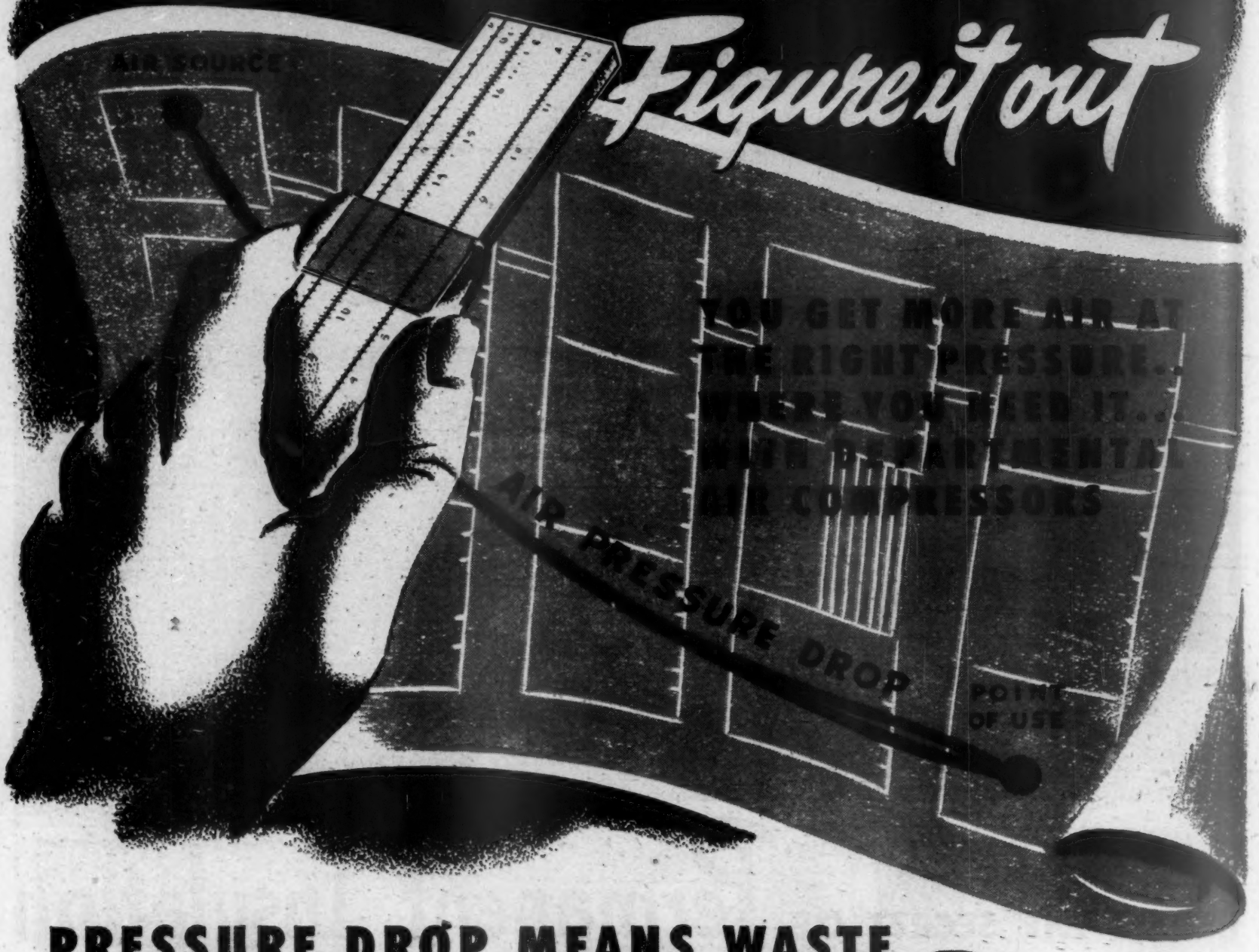

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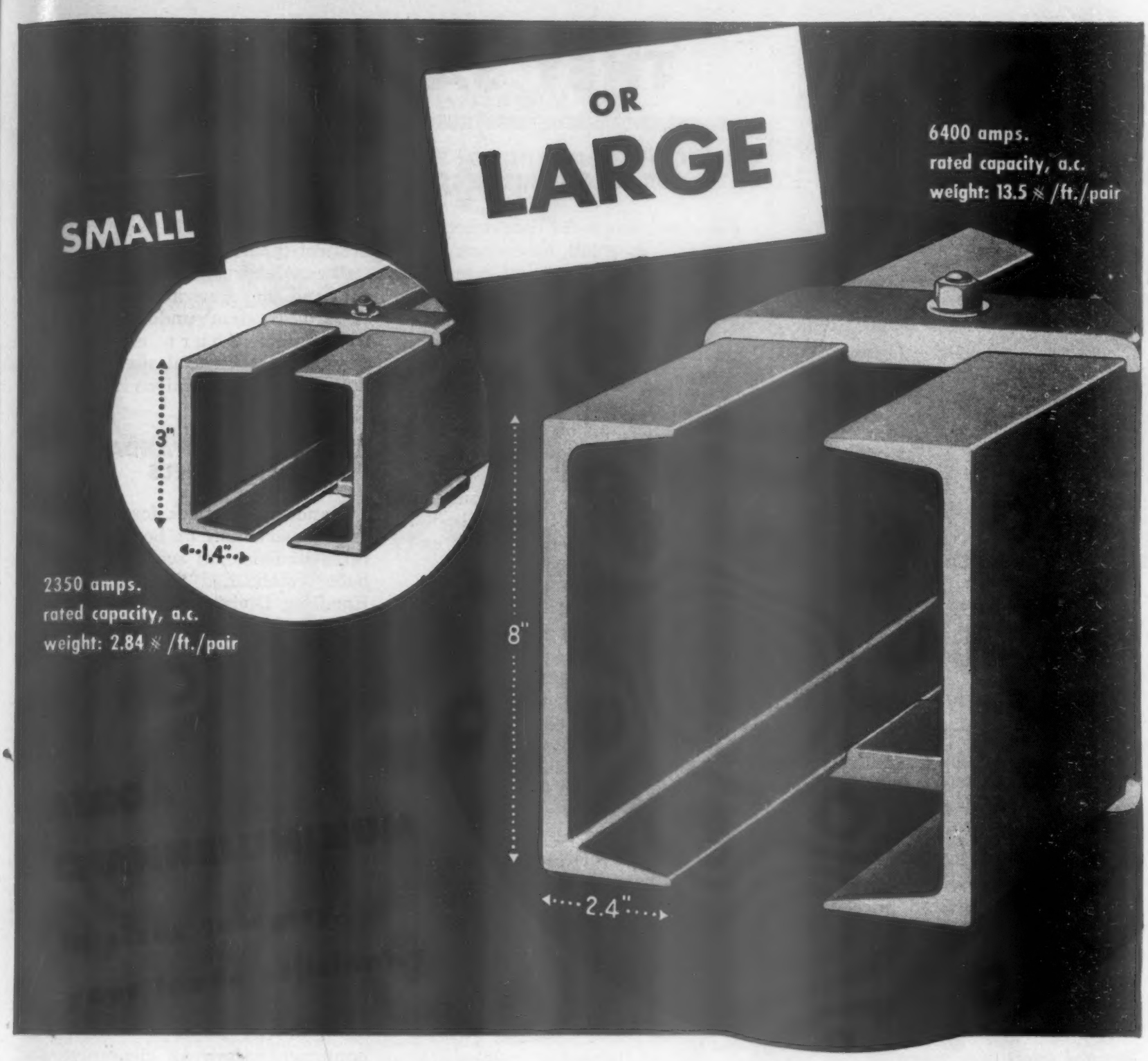

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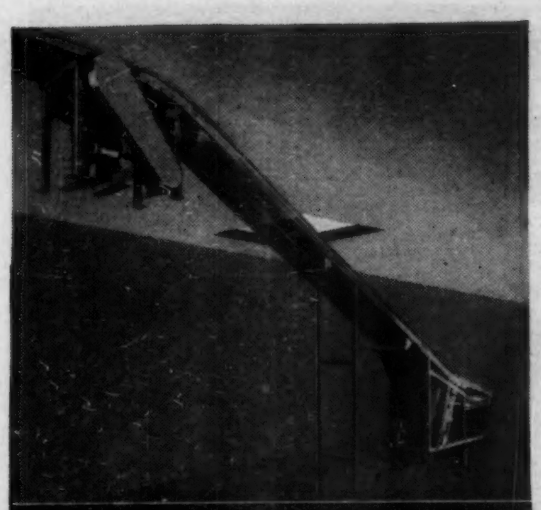

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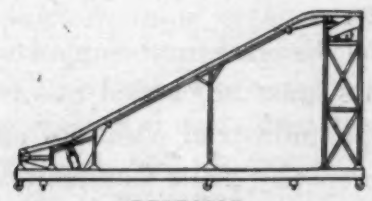

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THEY SAY AND DO

COLLECTIVE BARGAINING DATA FOR SMALL BUSINESSES

Facts and figures for true collective bargaining in small businesses will be the goal of a national research group now being formed. The body is affiliated with the National Foreman's Institute, a private corporation, and will be called the Collective Bargaining Research Council. Its head is Lawrence Stessin, former public relations director of the American Arbitration Association and currently labor editor of *Forbes Magazine of Business.* The Council's advisory board will include 30 top-ranking industrial relations executives and labor economists.

The Council plans to study techniques, trends, and standards on collective bargaining and labor relations practices. Research will be conducted on an "exchange of information basis," and the material is to be available to industry and unions alike on a membership arrangement.

The first study issued by the group will contain a breakdown of the wage increases and contract provisions resulting from 240 negotiations concluded during recent months, covering 51 industries in over 100 local industrial areas.

AUSTRALIA AMENDS ITS LABOR LAWS

McGRAW-HILL WORLD NEWS, Melbourne, Australia

Sweeping reforms in the handling of industrial relations are proposed in the amending Arbitration Bill introduced by Dr. Evatt, Australia's foreign minister and attorney-general.

Although Australia's Arbitration Court has important practical achievements to its credit, it has not satisfied all hopes that were built on it. A branch of the Commonwealth Judiciary, the Court is unable to interfere in labor-management dissensions unless and until they have spread over the borders of at least one state.

It is now proposed to confine the functions of the Court to decisions on standard hours, the basic wage, annual leave, and minimum rates of female pay and to place considerable powers in the hands of Conciliation Commissioners, of whom fifteen may be appointed. The Bill empowers a commissioner to take action to settle a dispute with or without notification by the parties. Commissioners will be assigned to particular industries or groups of industries and may, where conciliation fails, act in an arbitral capacity to prevent or settle strikes. In practice, this may mean the end of Australia's celebrated "award" system under which the Arbitration Court established ("awarded") several dozen sets of different labor conditions in industry.

ASME SETTING STANDARDS FOR PLANT MODELS

Standard practices for the design and construction of both two- and three-dimensional scale models are being established by the Materials Handling Division of the American Society of Mechanical Engineers.

The first report of the committee, dealing with standards for plant layout templets, is due to be released in the near future. These recommendations cover scale, general outline, detail, clearances, interferences, data, identification, special features, and printing specifications for equipment templets.

Features being studied for the second part of the report on three-dimensional models cover scale, detail, finishes, allowances and clearances, materials and construction, and identification. Tentative conclusions indicate that scale models should be readily distinguishable as representative of the actual machines or equipment; show all clearances required under extreme operating and service conditions of the machine and all pertinent data required by the plant-planning engineer.

TRENDS SHOWN IN EXTENT OF UNION RECOGNITION

Workers under terms of written collective bargaining agreements numbered almost 15 million in 1946, or nearly a million more than in 1945, according to a recent U. S. Department of Labor report. The 1946 figure represented a coverage of 48 per cent of the 31 million employed in fields where unions have sought agreements. The percentage was the same in 1945, when there were only 29 million such workers. In the period 1941-1946, the total number of workers under agreements increased from 10.3 to 14.8 million.

In 1946, 7.9 million manufacturing wage earners (70 per cent) were

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- **Most effective starter yet produced.**
- **Gives long life to ballast because defective lamp is locked out. Prevents overheating.**
- **The life of the AUTOMATIC starter is many times greater than that of average lamp.**
- **It saves maintenance costs and power consumption. Protects and insures longer life to ballast and lamp.**
- **Millions in use — Repeat orders prove trade acceptance.**

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FLEX-LOC
Lamp Holder

PATENTED

FEATURES

- **FLEXIBLE — Self-adjusting to variations in length of lamps. The ONLY lamp holder that flexes.**
- **AUTOMATIC LOCK—Lamps positively cannot fall out. Electrical contacts grip both sides of lamp pins.**
- **SIMPLE STREAMLINED DESIGN — No turning or twisting of lamps necessary.**
- **NO NEED TO CHANGE fixture layout. Engineered to fit all standard fixture spacings.**

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covered by agreements, as against 6.9 million (35 per cent) non-manufacturing employees.

The number of workers covered by closed shop and union shop agreements rose from 6.2 million for 1945 to 7.4 million in 1946. The number of workers under maintenance of membership provisions fell off from its wartime upswing to show a decline from 3.9 million in 1945 to 3.6 million in 1946.

The Bureau of Labor Statistics report also showed that nearly 6 million workers (41 per cent of all under union contracts) were covered by some form of check-off provisions in 1946, an increase of almost three-quarters of a million over the previous year. Dues were automatically deducted for slightly more than half of these workers; others specified check-offs by individual written authorization.

SICKNESS BENEFITS SURVEYED IN NEW YORK

Sickness benefit programs protect 40 to 50 per cent of the workers in the state of New York, according to a report just completed by the National Industrial Conference Board. Nearly 900,000 workers were polled in the Board's study.

Additional findings show that workers in the petroleum, communications, and utility industries maintain the highest standard of protection against loss of wages occasioned by accidents and illness.

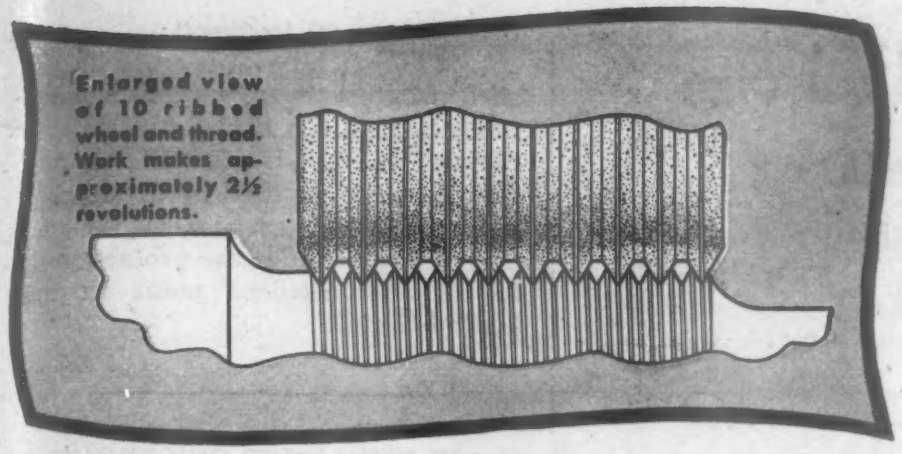
The ratio of coverage was also found to increase with the size of the company, as is shown by the following table:

Number of employees	*Per cent of coverage*
25 to 99	39.2
100 to 199	62.5
200 to 499	63.3
500 to 999	82.2
1000 and up	89.0

In about half the cases, employees pay none of the cost of the sickness benefit program; about one-third share the cost with the employer; and one-sixth pay the entire amount. When the cost is shared, the usual ratio is a 50-50 split.

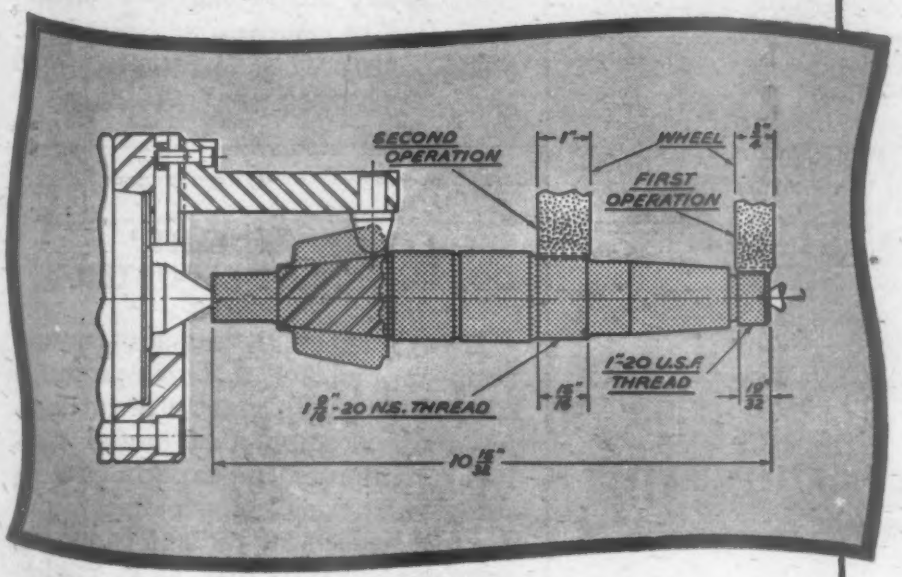
According to the report, there has been a marked rise in disability rates during war years. The principal reason—an increase in the number of claims rather than an increase in the severity or duration of disability.

It is further pointed out that sickness benefit programs have had a remarkable growth. Before 1930,



HERE'S *Production* THREAD GRINDING . . . Ground from the Solid in *15 seconds*

1"—20 N.S. THREAD, GROUND FROM THE SOLID



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"PRODUCES NEAR PERFECT THREAD"

"EXPENSIVE HAND DIE OPERATIONS ELIMINATED"

"NO MARRED THREADS ON THE ASSEMBLY LINE"

"WHEEL COST PER PIECE LESS THAN THREAD HOB AND CHASER COST"

The Timken Detroit Axle Company, prominent manufacturer of heavy truck axles, has this to say about a Jones & Lamson Automatic Multi-Ribbed Thread Grinder installed to grind the threads on axle drive pinions.

"The threads are machined as a last operation following heat treat and grinding of all bearing diameters and prior to lapping. The machine produces a near perfect thread and eliminates all expensive hand die operations along the line and overcomes marred thread on the assembly line".

". . . the grinding of threads also reduces direct labor costs and indirect cost of cutting tools and equipment".

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such programs were largely isolated undertakings. In 1934, 1,650,000 employees in the United States and Canada were covered by group policies. In 1944, nearly 6,000,000 employees were under the protection of health and accident plans in the United States.

THE HIGH COST OF STRIKES—An estimated $85,000,000 payroll and production loss was chalked up by the 328-day Allis-Chalmers' strike, according to company estimates, including $20,000,000 lost in payrolls, and a $65,000,000 production loss.

RESULTS OF "RADIANT" COOLING TESTS REPORTED

Experiments with "radiant" cooling seem to indicate that temperature conditioning with great air-wall differentials is impractical under certain conditions. The experiments—a study of physical, physiological, and comfort aspects of radiant cooling—were described by Prof. C. P. Yaglou of the Harvard School of Public Health before the American Society of Heating and Ventilating Engineers.

The objective of the tests described by the speaker, and conducted by him and Dr. Oscar Schneider some years ago, was to determine whether comfort could economically be maintained with high summer temperatures and humidities, and without entrance and exit "shock." Tests were carried out in a small wall-cooled room, built inside a larger room, which was conditioned by conventional methods.

Chilled water, in some cases near freezing, was circulated through coils embedded in three of the walls of the experimental room. The tests were run with dry bulb air temperatures between 75 and 95 deg. F. and with relative humidities between 40 and 70 per cent.

Subjects entered the wall-cooled cubicle from the outer "hot" room, which had no cooled walls; they remained in the cool room for two or more hours and then returned to the hot room again. Skin and clothing surface temperatures were recorded at 23 points, and various other measurements were made.

With the air at 75 degrees, the mean wall temperature required to produce comfort for men wearing customary warm-weather clothing,

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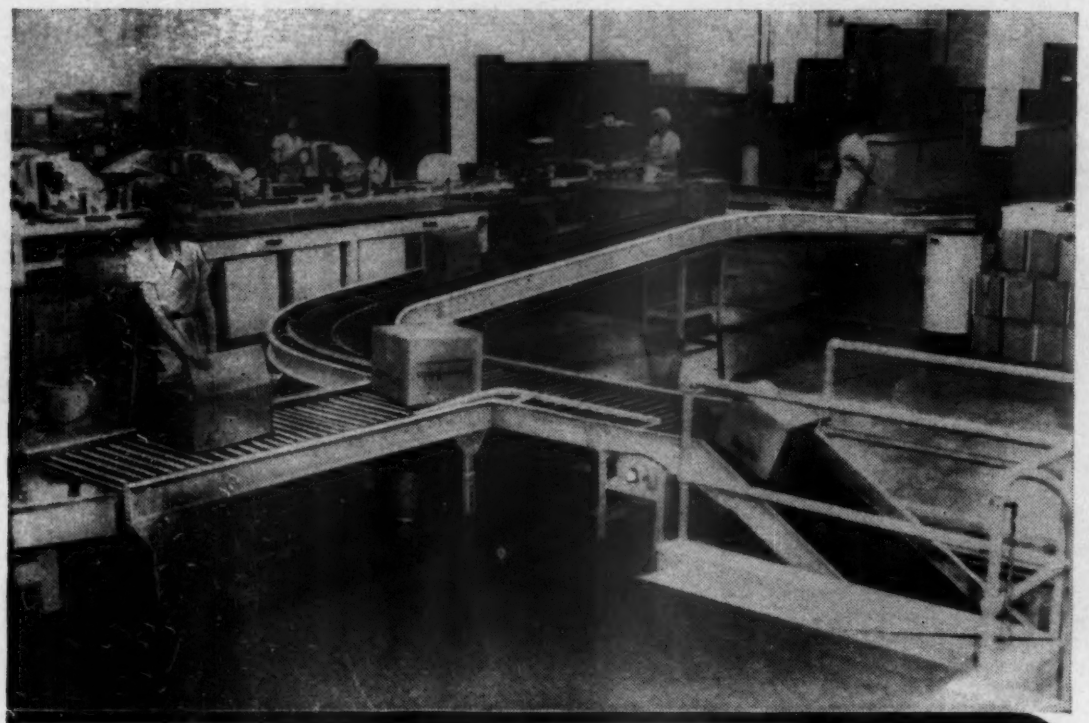

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was about 75 degrees, Yaglou stated. As the air temperature was increased, the required mean radiant temperature ("wall" temperature) had to be lowered until at about 90 degrees the mean radiant temperature was near 65 degrees. The mean temperature of the cooled walls was then 40 degrees and the temperature of the water circulating through the coils was about 35 degrees. With cubicle temperatures of about 89 degrees for men and 92 degrees for women, air temperature had no effect on comfort because the mean "clothing" surface temperature approached air temperature.

Higher Temperatures for Women

For women, as compared with men, consistently higher (two or three degrees) wall and air temperatures produced comfort, partly owing to their lower metabolic rate and partly because of the considerably lighter weight of clothes worn by the women. For both men and women, regardless of air and wall temperatures, subjects were comfortable when their skin temperature averaged 93 degrees.

The greatest asset of "radiant" cooling was a distinct alleviation of thermal shock on entering and leaving the cubicle. The sudden drop of mean skin temperature on entering the cubicle from the outer room kept at 95 degrees and 40 per cent relative humidity, was only 1.5 degrees when the walls were cooled, as against 3.5 degrees when the air was cooled to 80 degrees and 50 per cent relative humidity (walls also at 80 degrees). After a two-hour exposure, the mean skin temperature approached 93 degrees in both instances.

Under experimental conditions, the refrigeration load for "radiant" cooling was from 1.4 to 4.2 times greater than that needed when the cubicle was air cooled to 80 degrees and 50 per cent relative humidity (walls and air at 80 degrees), by the circulation of conditioned air. The higher the cubicle temperature and humidity, the higher was the load ratio. This unusually high refrigeration load with "radiant" cooling was due to the large quantities of warm and humid air that had to be circulated through the cubicle in order to maintain a substantial wall-air differential for the purpose of the study. As a result there was much unnecessary cooling of air and condensation of moisture on cold walls, whose temperature had to be below the dew point temperature of the air to produce comfort with high summer temperatures and humidities. With-

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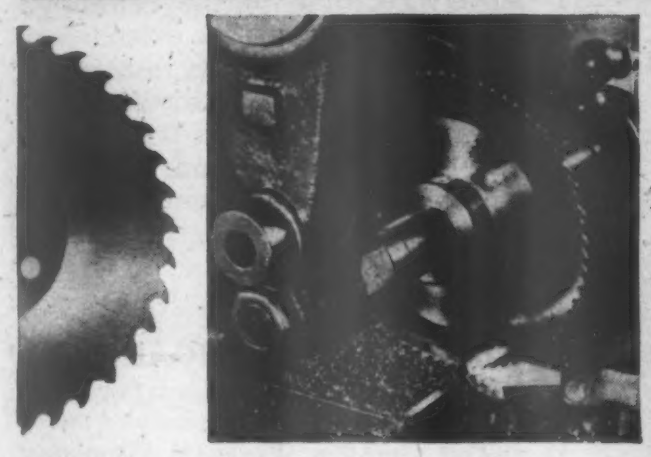

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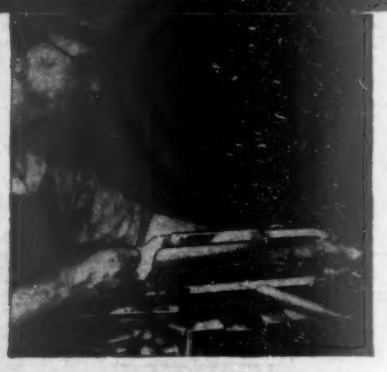

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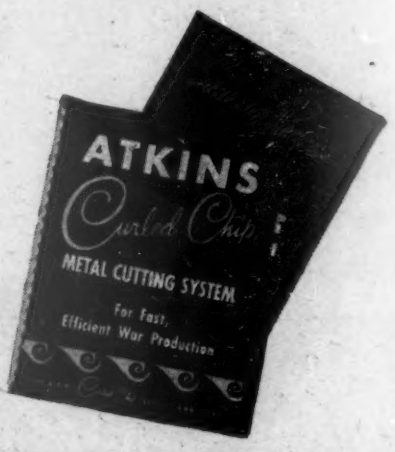

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out circulation of air, the humidity soon rose to the saturation point, and there was a steep vertical temperature gradient, as high as 30 degrees from floor to ceiling when the outer room was at 95 degrees and the cooled walls at 39 degrees. Introduction of dehumidified air to reduce wall condensation was not attempted.

In the light of these experiments, it would seem that "radiant" cooling with great air-wall differentials is not practical, particularly when the humidity is high. Wall cooling is also impractical in rooms occupied by many persons, owing to interference of body heat loss by radiation to the cold walls.

TIME-OFF GRANTED FOR MILITARY TRAINING

Employees of the Standard Oil Company (New Jersey) will be given a 15-day annual leave of absence for peacetime military training. The leave, according to the company's announcement, will be extended to employees taking part in reserve and universal training programs adopted by the government. It will not be counted as vacation and employees will receive the difference between their regular pay and remuneration from the government.

JUNIOR UNIONS ORGANIZED IN GEORGIA

The Georgia Workers' Education Service is organizing a "Junior Union of America" for youths 8 to 14 years of age in the state of Georgia.

Backed by both AFL and CIO, the organization proposes to prepare "boys and girls through actual experience for good citizenship and efficient union membership as they reach maturity." The children will "sing songs, put on skits, and engage in folk songs and other suitable recreation." Units of the organization will be autonomous and members will elect their own officers.

The *Atlanta Constitution* has summed up the pro and con of the project in these terms:

"It is difficult, considering the state of education in Georgia today, to quarrel even mildly with those who would bring further enlightenment. We have no reason to question [the organizers'] motives as anything other than the desire to perform a public service. Yet the idea of organizing young people into 'unions,' by implication setting them apart as a class and indoctrinating them with

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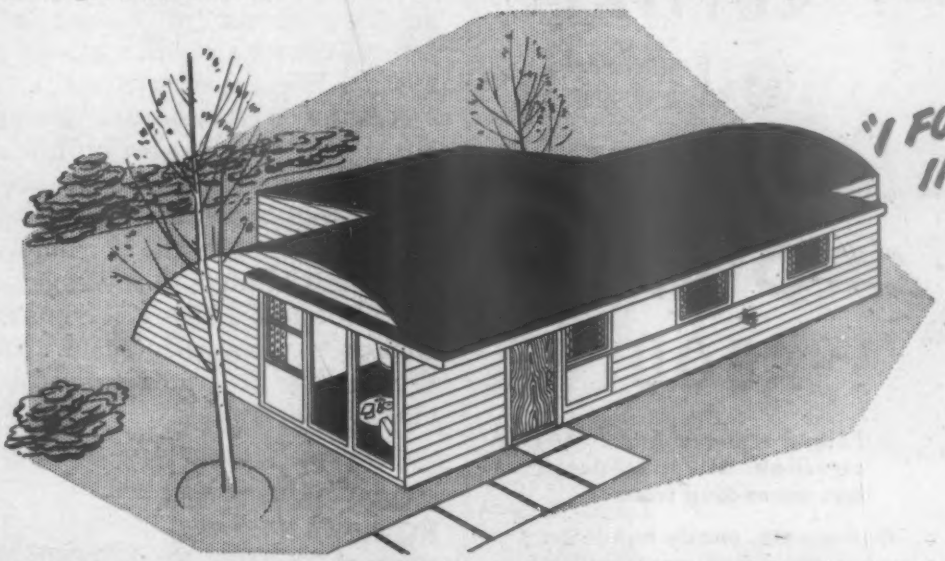

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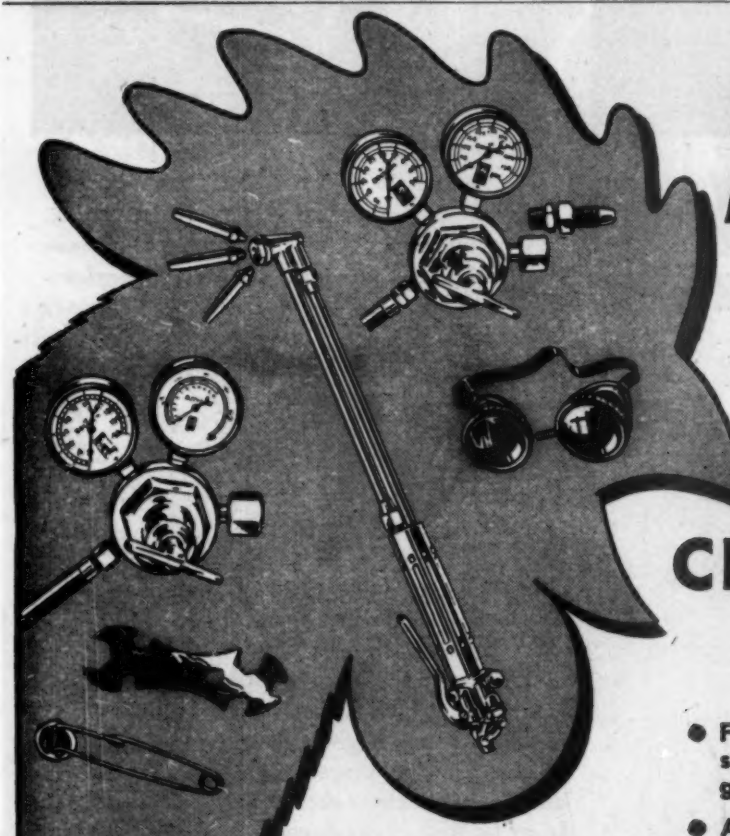

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a set of economic precepts, is not one that can be accepted with tremendous enthusiasm. . . . In America there still remains the strong and vigorous tradition of a classless society, a system wherein the only limits imposed upon an individual's success are the limits of his or her talent and industry. . . . It is our instinctive democratic dislike for any sort of schooling that might set class against class which leads us to look askance at the Georgia Workers' Education Service idea for a Junior Union."

INDUSTRIAL MEDICINE'S ROLE DEFINED

ROBERT COLLIER PAGE, M. D., General Medical Director, Standard Oil Company (New Jersey)

Modern concept of an industrial medical department implies that it is a service unit—of service primarily to the employee in professional consideration of his personal well-being; to the employer who, out of interest in employee welfare, finances the enterprise; and to the public at large who eventually benefit by the facts and ideals regarding constructive medicine promulgated by a competent medical department.

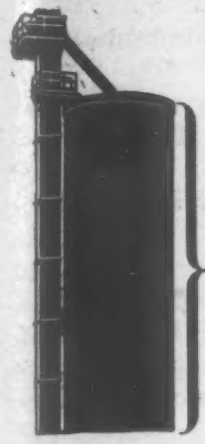
UNION GOES ON THE AIR TO WIN GOOD WILL

Latest union approach to the gaining of public good will is sponsorship of a regular weekly radio newscast. On April 23 the United Electrical Workers Union—CIO made its bow as the sponsor of commentator Leland Stowe over 55 stations of the Mutual Broadcasting System.

Stowe's contract with the union has a clause guaranteeing him complete freedom with regard to the content of his broadcast, and, during a trial period at least, "commercials" are being limited to messages of an "institutional" nature. Figures for similar newscasts indicate that the Wednesday programs will cost UER about $4000 a week.

COMPANY WINS FOREMAN CASE

Uncertainty as to employer liability under the Fair Labor Standards (Wage-Hour) Act is not ended by President Truman's signing of legislation outlawing portal-to-portal claims. It extends to the question of which employees are covered by the law and thus required to receive time and one-half after 40



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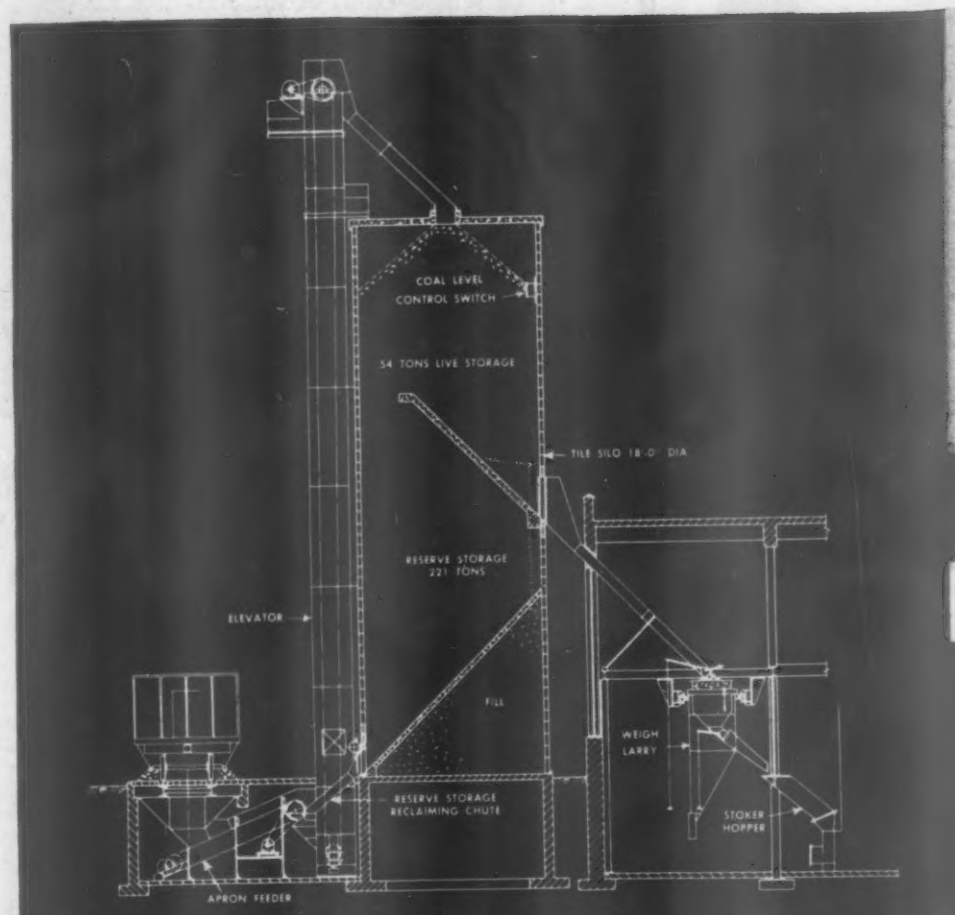

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A difference of opinion on this latter point among federal judges was disclosed recently in a decision of the Supreme Court over the law's applicability to three operating engineers in the power plant of General Industries Company, Elyria, Ohio. The Court split 6 to 3 over the simple issue of whether the engineers were supervisors and, consequently, exempt from the law's requirements.

By finding that the engineers were supervisors, the Court's majority reversed a unanimous decision of a three-judge Circuit Court of Appeals in Cincinnati. This Court had in turn reversed the ruling of the trial judge, which was against the findings of Wage-Hour Administrator L. Metcalfe Walling that the engineers were covered by the 1938 law.

The portal-pay Act now clarifies what activities are working time and must be computed in determining the 40-hour week, and limits the extent of employer liability by means of a statute of limitation. But it does not touch on the question of which employees are covered by the Wage-Hour law.

Ironically, the Court of Appeals, in ruling that the engineers were not supervisors and should receive time and one-half for overtime, found that the company actually did pay it and was not in violation. Nevertheless the company took its contention that it was not required to pay overtime to the Supreme Court and won.

Asked To Be Foremen

General Industries produces small motors and plastic products. The three operating engineers, responsible to a chief engineer, asked, in 1944, to be regarded as foremen of the firemen and coal-passers and to continue to receive monthly salaries, vacations, pensions, and other benefits usually reserved for supervisors. Following this, the AFL Firemen & Oilers Union abandoned a long-contested claim of right to represent them.

Chief Justice Vinson, in the majority opinion, considered this as a formal recognition by the union of their supervisory status.

"Indeed," Justice Vinson continued, "the nature of the operations in the power house was such that the immediate and continuous supervision of trained persons was indispensable, and there were concededly no other employees to give such supervision."

The minority opinion, in which

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Justices Rutledge, Black, and Murphy joined, contended that, although the work of the engineers was highly skilled and complicated, it did not involve exercise of discretion, nor did they have the power to hire or fire. Further, they argued, the evidence showed the firemen and coal-passers took orders only from the chief engineer.

DEPRECIATION COSTS NEED REVISION

A good many manufacturers are carrying production equipment on their books at its cost several years ago, and are not charging depreciation at current cost of replacement, according to Machinery & Allied Products Institute. This means that, since they have not allowed for sufficient equipment depreciation in their selling prices, they will have to take dollars from reserves, or from loans, for necessary replacements. The Institute will soon issue a report on the subject.

BEHIND THE BYLINE

Facts About FACTORY'S Authors

G. R. Faustman (page 76) has been associated with Bendix Radio since 1940, holding positions as supervisor of time study, assistant plant superintendent, and administrative assistant to the factory manager. In 1945, he was appointed supervisor of the standards department. Before joining Bendix he was engaged in industrial engineering work at the Locke Insulator Corporation. He holds a B. E. degree from the Johns Hopkins School of Engineering and he is a member of the American Society for Quality Control.

Randolph W. Mallick (page 102) has written many magazine articles on the subjects of layout and handling, and was a contributing editor to the book, *Effective Foremanship*, published by McGraw-Hill in 1942. Starting with Westinghouse as a toolmaker apprentice, he worked through many manufacturing positions, including tool design, manufacturing

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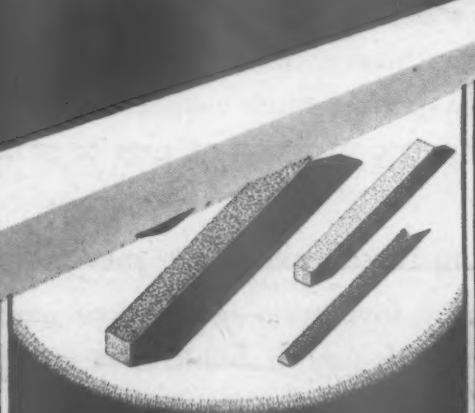

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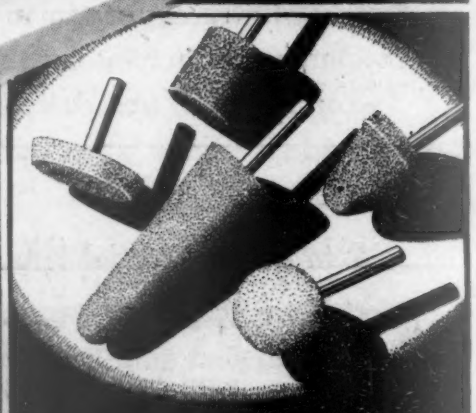

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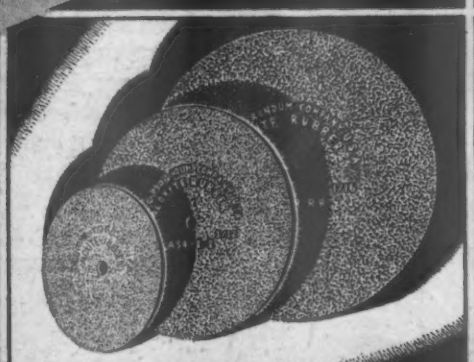
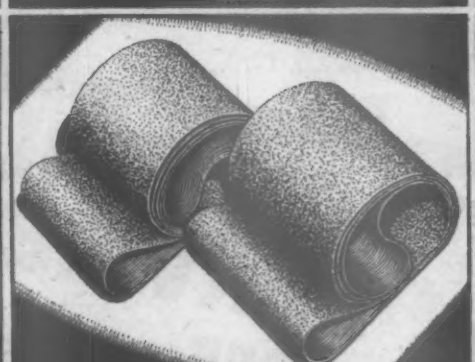
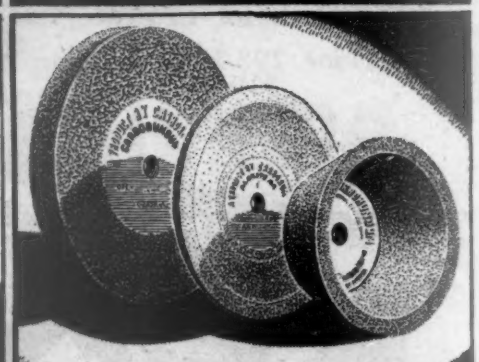


Cutting-Off Wheels . . the modern tool for faster, less costly, more finished cuts



A Coated Abrasive for every sanding and finishing condition



All standard shapes are supplied in grinding wheels by CARBORUNDUM

"KEX"

INDUSTRIAL WIPING TOWELS ARE MADE FOR WIPING!

YES SIR, they are uniform, smooth-textured wiping towels—made from new fabric woven for Industrial wiping towels, delivered to you thoroughly cleaned by a special high heat process—on regular schedules as required.

Their soft cotton texture is safe to use on any highly polished or sensitive surface. No hard seams, no hidden grit, no over-looked buttons, such as often turn up in make-shift wipers.

Instead, every KEX Industrial Wiping Towel is made for the important wiping purpose to which you will put it. Edges are bound to eliminate catching onto machinery. Surfaces are smooth and free of lint. They absorb up to six times their weight in grease and oil, and give more wipes per pound than cast-off rags or ordinary wipers.

Rent KEX Industrial Wiping Towels and figure your profits

Nothing to buy—no expensive inventory—just a low monthly rental. The first month you use this service should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX National Service, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

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"KEX" REG. U. S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

engineer, foreman, and special assignments. He is now assistant to the director, Headquarters Manufacturing Engineering Department. He is a member, senior grade, of the American Society of Tool Engineers, the Pennsylvania Society of Professional Engineers, and the National Society of Professional Engineers. He is a member of the American Society of Mechanical Engineers and serves as chairman of its Plant Layout Standards Committee.

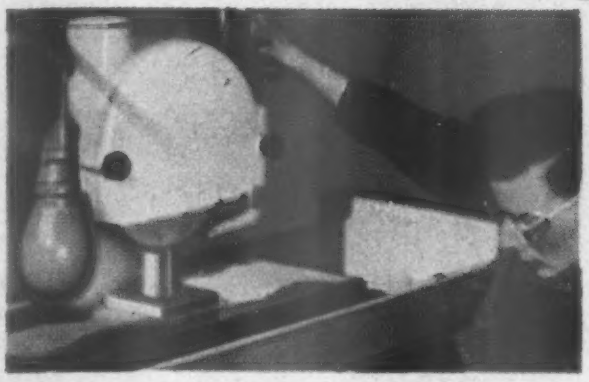
R. D. McMillen, (page 109) a lifelong resident of Cleveland, is a graduate of Ohio Wesleyan University and Lake Erie School of Law. He passed the Ohio State bar examination in 1932. His law training may to a large extent explain his deep interest in the thorough, orderly systems described in his article on personnel records. He became employment manager at The Parker Appliance Company in 1941 and director of personnel in 1945.

L. E. Markle (page 129) is the author of *Industrial Motor Control*, an ICS textbook, and co-author of *Controllers for Electric Motors*, McGraw-Hill, 1945. He is a faculty member of the University of Pittsburgh and teaches an evening course on "Fundamentals of Industrial Motor Controllers." He joined Westinghouse Electric Corporation in 1917, enrolling for a one-year graduate student training course. This was followed by work in drafting and engineering design for controllers used with all types of electric motors. Since 1930 he has been section engineering manager in charge of design of customers' orders for controllers in all industrial, Navy, and Marine applications. He has a B. S. degree in electrical engineering from Pennsylvania State College, and is a member of Sigma Tau honorary engineering fraternity and the American Institute of Electrical Engineers.

Behind the Byline biography for Harry L. Husson (page 79) appeared in connection with the first part of his article, published in the May issue of FACTORY.

Du Pont Color Conditioning helps employees

- SEE BETTER
- FEEL BETTER
- WORK BETTER



VISIBILITY. You will find comfortable seeing wherever Color Conditioning is used. By reducing glare, providing the correct degree of "brightness" within the worker's field of vision, eyestrain is eliminated, fatigue minimized.

SAFETY. The Du Pont Safety Color Code helps prevent costly accidents. With color and symbols, it points out fire-protection and first-aid equipment and warns workers against accident hazards.

MORALE. Color can make employees more content in their environment. Color Conditioning in restrooms, washrooms, cafeterias, etc., makes your plant more cheerful, betters employee-management relations.

FOR EVERY INTERIOR. Color Conditioning can be applied to every part of your plant. Offices, corridors, stairways, all interiors can be painted to provide an overall atmosphere that is pleasant and efficient.

Boston Woven Hose and Rubber Co., Cambridge, Mass.

THE ADVANTAGES of Du Pont Color Conditioning have been confirmed in hundreds of industrial plants. This scientific plan contributes to the worker's efficiency, health, comfort, and morale. It improves the rate and quality of production, cuts maintenance costs. Color Conditioning helps workers see better, feel better, work better. Find out how this proved plan can help you in your plant. Send coupon below to E. I. du Pont de Nemours & Co. (Inc.), Finishes Div., Wilmington 98, Del.

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(Straight shank, 5, 9, 12, 18, 24" drilling depths)

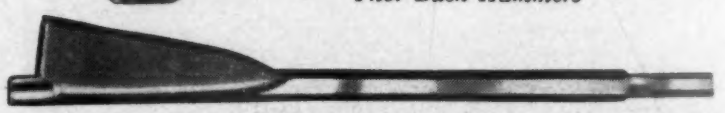
Thor Star Drills
(Taper shank, 5, 9, 12, 18, 24" drilling depths)

Thor Standard Chisels
(5, 9, 12" lengths)

Thor Bull Points

Thor Mortar Chisels

Thor Bush Hammers



Thor Web Cutting Tools

Thor Wood Gouges

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Thor Scaling Chisels

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Export Division: 330 West 42nd Street, New York 18, New York

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Thor PORTABLE POWER TOOLS

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He pulls production DOWN!

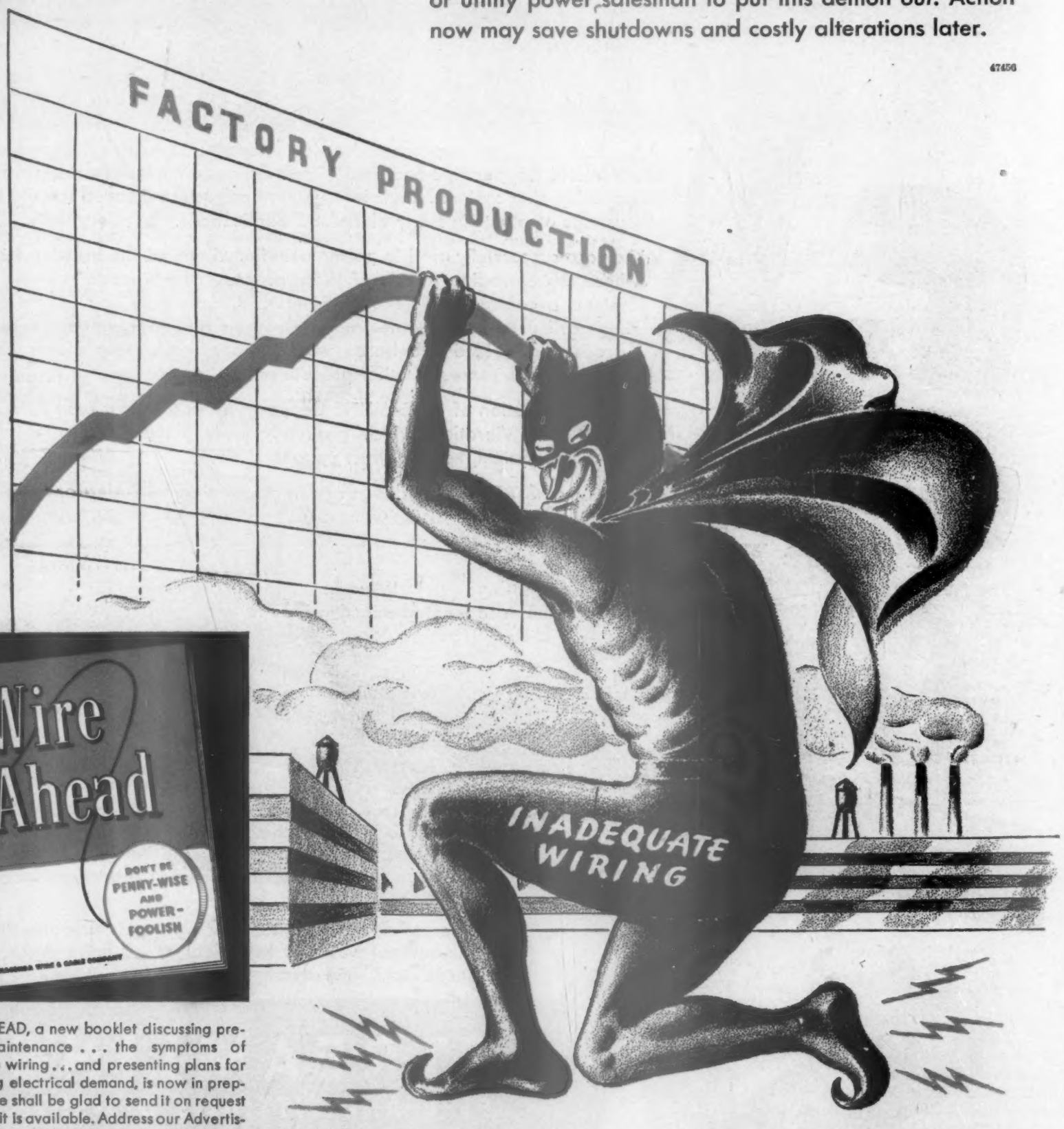
Because adequate wiring is basic ... and affects everyone in our industry ... Anaconda continues to promote this idea in a wide list of national magazines.

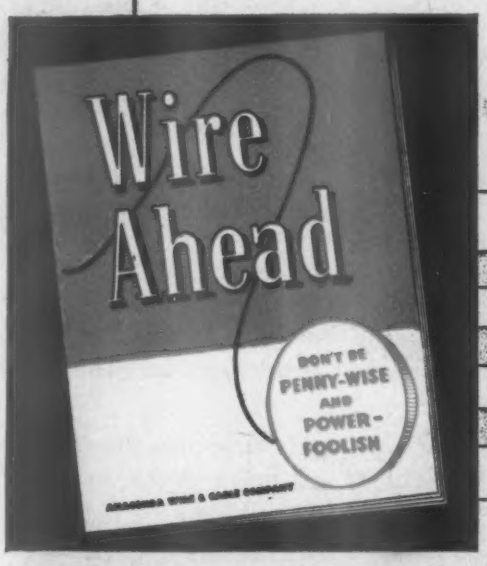
INADEQUATE WIRING, the industrial jinx, upsets the best of calculations—the most thorough planning.

Production quotas are a fiction, the most modern machines are inefficient, the best of workmen are frustrated when overtaxed, over-extended obsolete wiring can pull down plant efficiency 25 percent* or more.

To get the production curve up, ask your plant power engineer, your consulting engineer, electrical contractor or utility power salesman to put this demon *out*. Action now may save shutdowns and costly alterations later.

47456





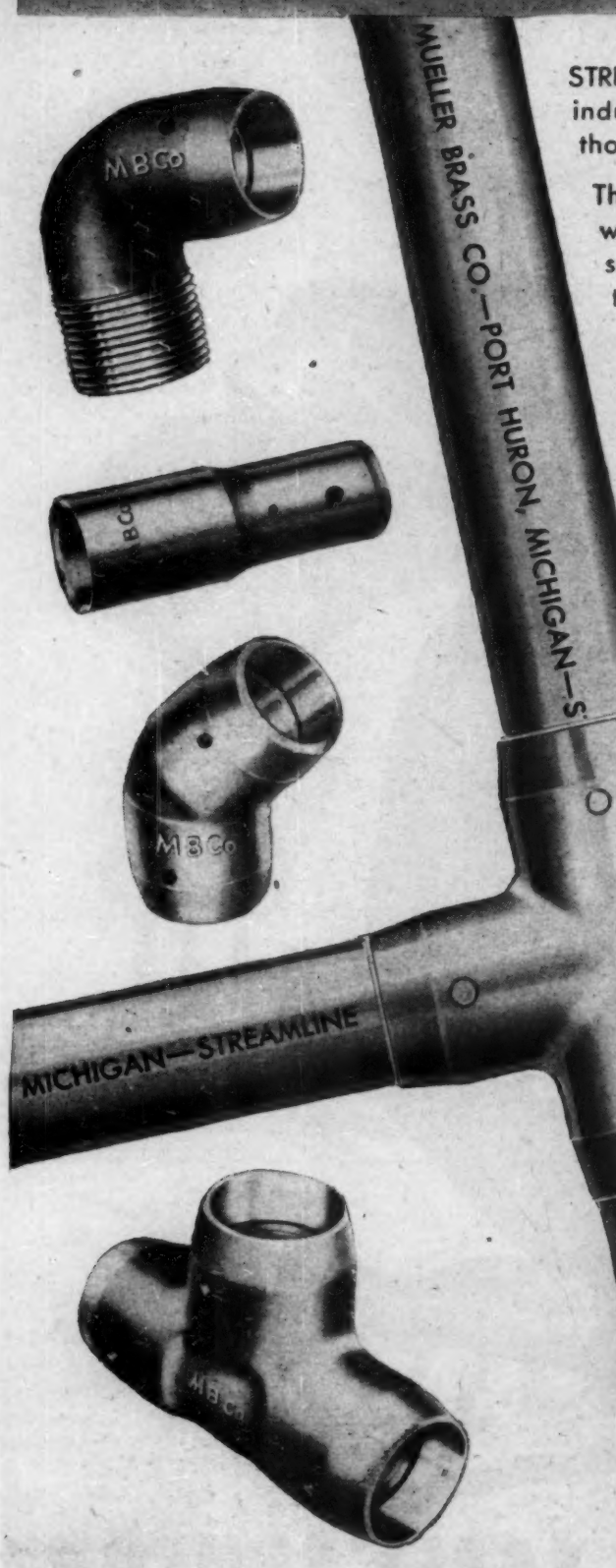
*WIRE AHEAD, a new booklet discussing preventive maintenance . . . the symptoms of inadequate wiring . . . and presenting plans for anticipating electrical demand, is now in preparation. We shall be glad to send it on request as soon as it is available. Address our Advertising Department, 25 Broadway, New York 4, N.Y.

ANACONDA from mine to consumer

ANACONDA WIRE AND CABLE COMPANY

FUNDAMENTALLY RIGHT FOR INDUSTRIAL PIPING SYSTEMS

✓CHECKS AT EVERY POINT THAT ENGINEERS DEMAND



STREAMLINE Copper Pipe and Solder Type Fittings are particularly ideal for most industrial piping systems. Their installation has vastly improved the facilities of thousands of plants in many diversified applications.

They are successfully used in paper manufacturing and the brewing industries where the corroding effects of these processes have made rustable piping systems a constant problem. STREAMLINE Copper Pipe and Solder Type Fittings are used in distilleries, wineries, sugar refineries, vinegar mills, starch processing, aniline and borax works, rubber reclaiming plants, oil refineries, and in scores of other process piping applications.

An installation of STREAMLINE Copper Pipe and Solder Type Fittings does not rust. Vibration, which gradually loosens the joints of a threaded piping system, has no effect upon it.

Since STREAMLINE Fittings are not connected by flaring or threading, no room is required for wrench play to tighten the Fittings into place, nor need any allowance be made for protruding valve stems, which on threaded pipe, must be swung in an arc to secure. Valves and fittings are installed in a minimum of space, they are located exactly where required, and soldered.

STREAMLINE Solder Fittings have the greatest manufactured range on the market—there is no other line of solder fittings even closely approaching it in variety and completeness. STREAMLINE Solder Fittings are made in sizes from ¼" to 12" inclusive, and in a complete series of reductions in tees and elbows.

Compression Stops with solder type ends are also furnished plain, without waste, or with right or left hand waste, in sizes from ⅜" to 1" inclusive.

STREAMLINE
PIPE AND FITTINGS DIVISION
MUELLER BRASS CO.
PORT HURON, MICHIGAN

Prefabrication Means Known Performance

With BullDog BUStribution DUCT

THERE are two ways to install electrical systems.

One way—*the old way*—is to have the system fabricated on the job site. Until the installation is complete, such vital operating characteristics as voltage drop and temperature rise will be deep, dark mysteries.

Voltage drop can plague your plant by cutting the power and efficiency of motors . . . dragging the output of lighting fixtures down below par. And excessively high operating temperatures are bound to take their toll by impairing performance and shortening the life of the electrical systems.

No Other Systems Offer So Much

The *new way* is the BullDog way, where prefabrication means known performance. BullDog Plug-In Type and BullDog Lo-X Feeder Type BUStribution DUCT are both built in standardized, prefabricated sections, laboratory-tested to provide accurate performance data *in advance of installation.*

No other system can offer this cost-saving feature, so call your nearby BullDog field engineer and learn more about the many advantages of BullDog BUStribution. He'll show you a successful installation near your own plant . . . and he'll be on the job to help when the time comes to design your system.

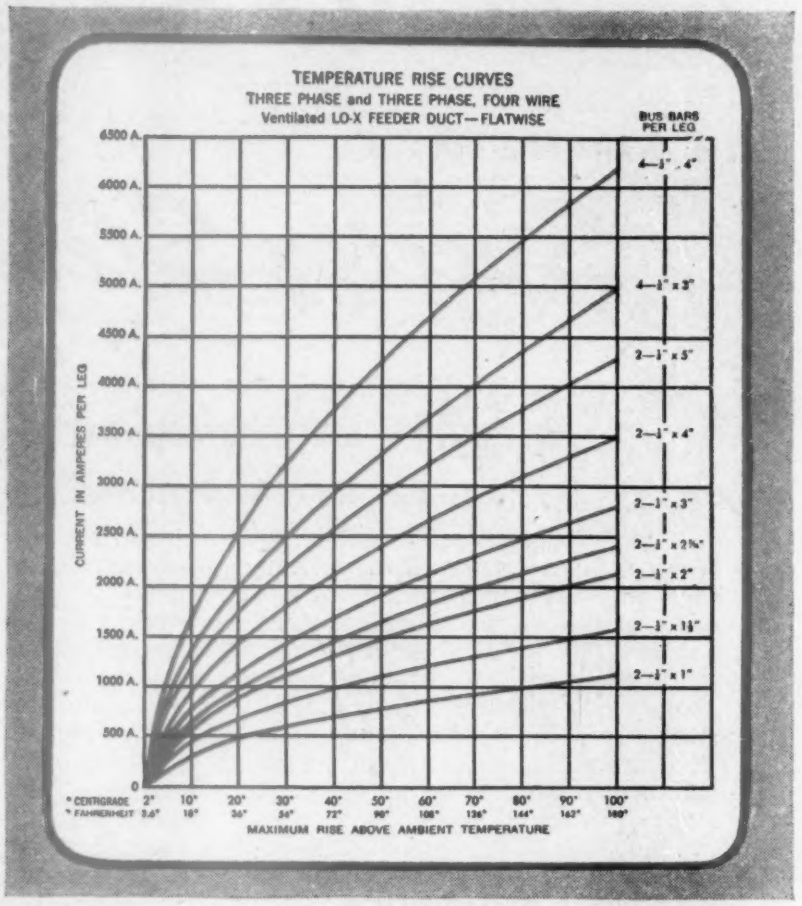
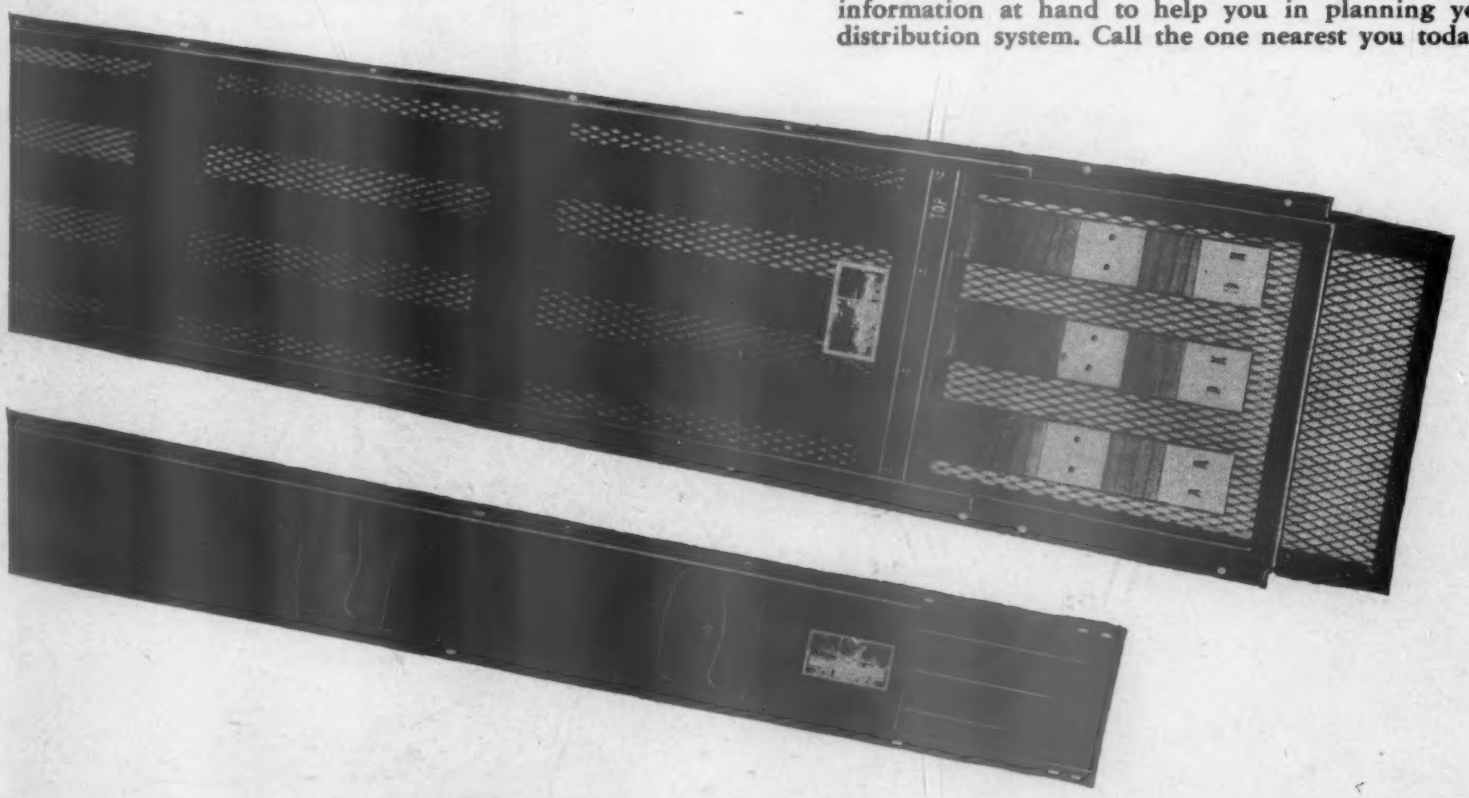


Chart shown is typical of the data on voltage drop and temperature rise available in advance of installation for all types of BullDog BUStribution DUCT. BullDog field engineers have this information at hand to help you in planning your electrical distribution system. Call the one nearest you today.



ADEQUATE WIRING SERVES AND SAVES

BULLDOG

ELECTRIC PRODUCTS COMPANY

Detroit 32, Michigan. Field Offices in All Principal Cities. In Canada: BullDog Electric Products of Canada, Ltd., Toronto

BullDog manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Superba and Rocker Type Lighting Panels—Switchboards—Circuit Master Breakers—"Lo-X" Feeder BUStribution DUCT—"Plug-in" Type BUStribution DUCT—Universal Trol-E-Duct for flexible lighting—Industrial Trol-E-Duct for portable tools, cranes, hoists.

FOR RESILIENCE...

Specify Rubber Belting

FOR STRENGTH...

Specify Steelply Reinforced

Up to 40% more horsepower delivered per inch of belt width!

NOW YOU CAN ENJOY all the advantages of belt drives without their usual shortcomings. They give you noiseless, efficient and shock absorbing power transmission. And when you specify belts reinforced with Roebling Steelply cord you add up to 40% more horsepower per inch of belt width. Stretch caused by peak loads or overload is practically zero . . . slashing belt creepage. The extreme flexibility of belts reinforced with Steelply cord permits far more compact installations. Their speed range is unlimited, down to the lowest speed. And their far greater strength can mean the use of fewer and smaller belts.

In planning new drives or ordering replacements, ask your supplier to show you how to reduce costs and increase efficiency with transmission belts reinforced with Steelply.

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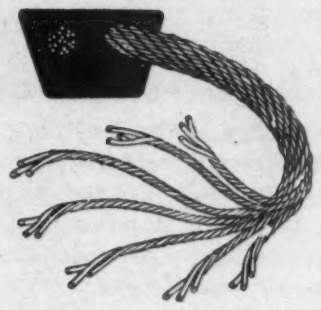
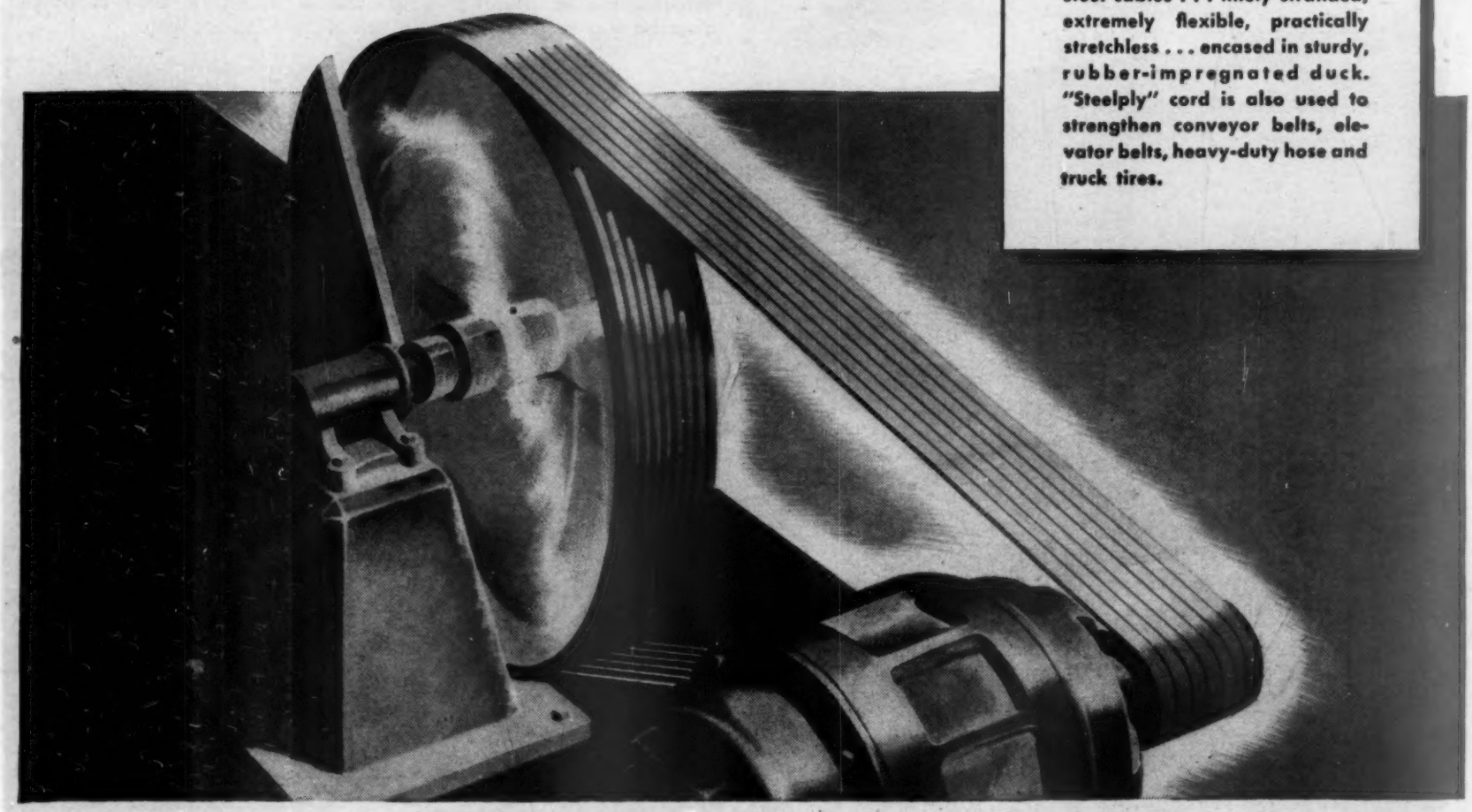


WHAT IS STEELPLY?

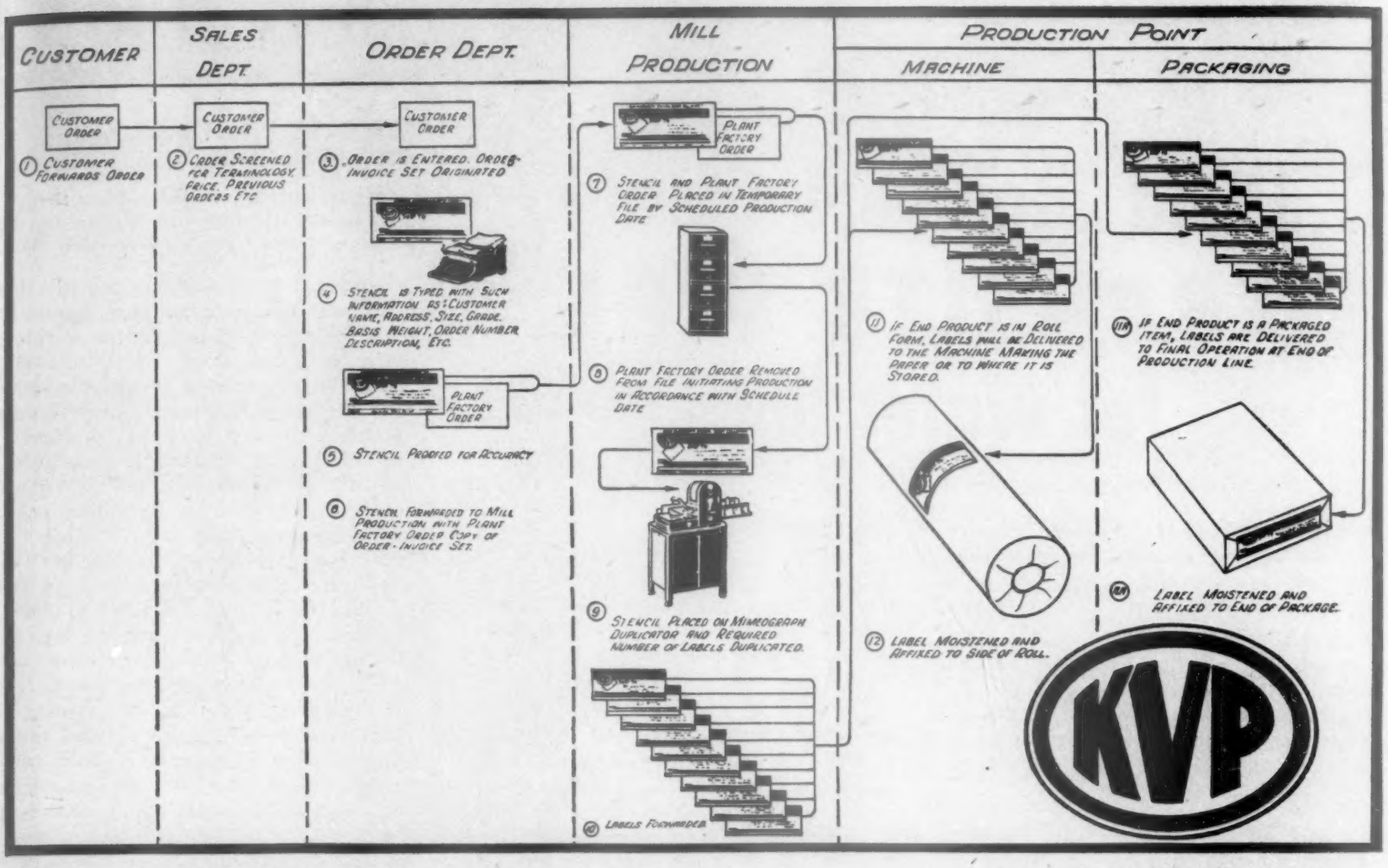
Roebling "Steelply" is the load-carrying core in the revolutionary new kind of transmission belting. It consists of small-diameter steel cables . . . finely stranded, extremely flexible, practically stretchless . . . encased in sturdy, rubber-impregnated duck. "Steelply" cord is also used to strengthen conveyor belts, elevator belts, heavy-duty hose and truck tires.

Adds the Strength of Steel to the Resilience of Rubber



ROEBLING

A CENTURY OF CONFIDENCE


CUSTOMER
SALES DEPT.
ORDER DEPT.
MILL PRODUCTION
PRODUCTION POINT
MACHINE
PACKAGING
CUSTOMER ORDER
1. CUSTOMER FORWARDS ORDER
2. ORDER SCREENED FOR TERMINOLOGY, PRICE, PREVIOUS ORDERS ETC
3. ORDER IS ENTERED. ORDER-INVOICE SET ORIGINATED
4. STENCIL IS TYPED WITH SUCH INFORMATION AS: CUSTOMER NAME, ADDRESS, SIZE, GRADE, BASIS WEIGHT, ORDER NUMBER, DESCRIPTION, ETC.
PLANT FACTORY ORDER
5. STENCIL PROOFED FOR ACCURACY
6. STENCIL FORWARDED TO MILL PRODUCTION WITH PLANT FACTORY ORDER COPY OF ORDER-INVOICE SET.
7. STENCIL AND PLANT FACTORY ORDER PLACED IN TEMPORARY FILE BY SCHEDULED PRODUCTION DATE
8. PLANT FACTORY ORDER REMOVED FROM FILE INITIATING PRODUCTION IN ACCORDANCE WITH SCHEDULE DATE
9. STENCIL PLACED ON MIMEOGRAPH DUPLICATOR AND REQUIRED NUMBER OF LABELS DUPLICATED.
10. LABELS FORWARDED
11. IF END PRODUCT IS IN ROLL FORM, LABELS WILL BE DELIVERED TO THE MACHINE MAKING THE PAPER OR TO WHERE IT IS STORED.
12. LABEL MOISTENED AND AFFIXED TO SIDE OF ROLL.
11A. IF END PRODUCT IS A PACKAGED ITEM, LABELS ARE DELIVERED TO FINAL OPERATION AT END OF PRODUCTION LINE.
12A. LABEL MOISTENED AND AFFIXED TO END OF PACKAGE.
KVP

Label Problems Solved!

Flow chart shows how Mimeograph brand duplicator and supplies helped solve complex labeling problems for leading paper manufacturer

How do you want your paper?

Parchment . . . waxed . . . bond . . . high-grade special wrappings . . . greaseproof and household specialty papers—Kalamazoo Vegetable Parchment Company, Kalamazoo, Michigan, makes them all.

And, naturally, with this variety of production—and a variety of packages, by rolls or by customer-specified cut sizes and quantities—KVP had a complex labeling problem.

They turned to the Mimeograph brand duplicator and form-topped Mimeograph brand stencils for help.

And they got help—plus important savings in paper-work preparation, time and labor running to thousands of dollars annually.

The flow chart above shows the recommendations of our duplicating experts and the solutions to KVP problems. And here's why the solutions were successful:

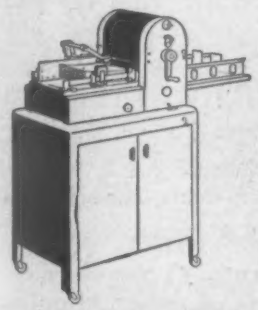
1. Clear, easy-reading, black-and-white label copy with permanent, rubproof Mimeograph brand ink to resist adverse handling, shipping, and storage conditions.

2. Centralized preparation of labels from master stencil. Gummed label stock is automatically fed by the Mimeograph brand duplicator.

3. Form-topped Mimeograph brand stencil sheets for accurate positioning of customer's order data right on the finished label. Stencil can be filed and used again.

4. Plenty of copies of each label whether customer's order calls for tens or hundreds of packages. (KVP label requirement averages 50 copies, sometimes goes as high as 4,000 copies.)

This paper-work problem and its solution are typical of the results Mimeograph duplication and the work of our duplicating experts are securing for leading companies everywhere. Call the distributor nearest you, or write us for full information on how we can work with you.



FREE! Complete case study of the KVP tag and label problem—including the flow chart reproduced above—plus samples of the finished labels and the form-topped Mimeograph brand stencil sheet that did the work. It's free! Clip and mail the coupon today!

The Mimeograph brand duplicator

is made by

A. B. Dick Company, Chicago

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Send me a copy of your case study of the KVP tag and label problem.

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JOINTS *STAY* TIGHT . . . because of Transite's Simplex Coupling. This factory-made coupling is simply *assembled* on the job, providing a joint which is both tight and flexible. It safeguards against underground leakage; its flexibility helps compensate for soil stresses and the vibrations of heavy traffic.

MAINTENANCE *STAYS* LOW... because Transite is exceptionally resistant to soil corrosion—a primary cause of high water pipe maintenance. In comparative tests in corrosive soils, in which other pipe materials have failed, Transite has actually become stronger with age!

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Yes—more and more plant engineers have found Transite the answer to their pipe line problems . . . are specifying Transite for water supply lines, for fire lines and for process lines of many types. Get all the facts by writing Johns-Manville, Box 290, New York 16, N. Y.

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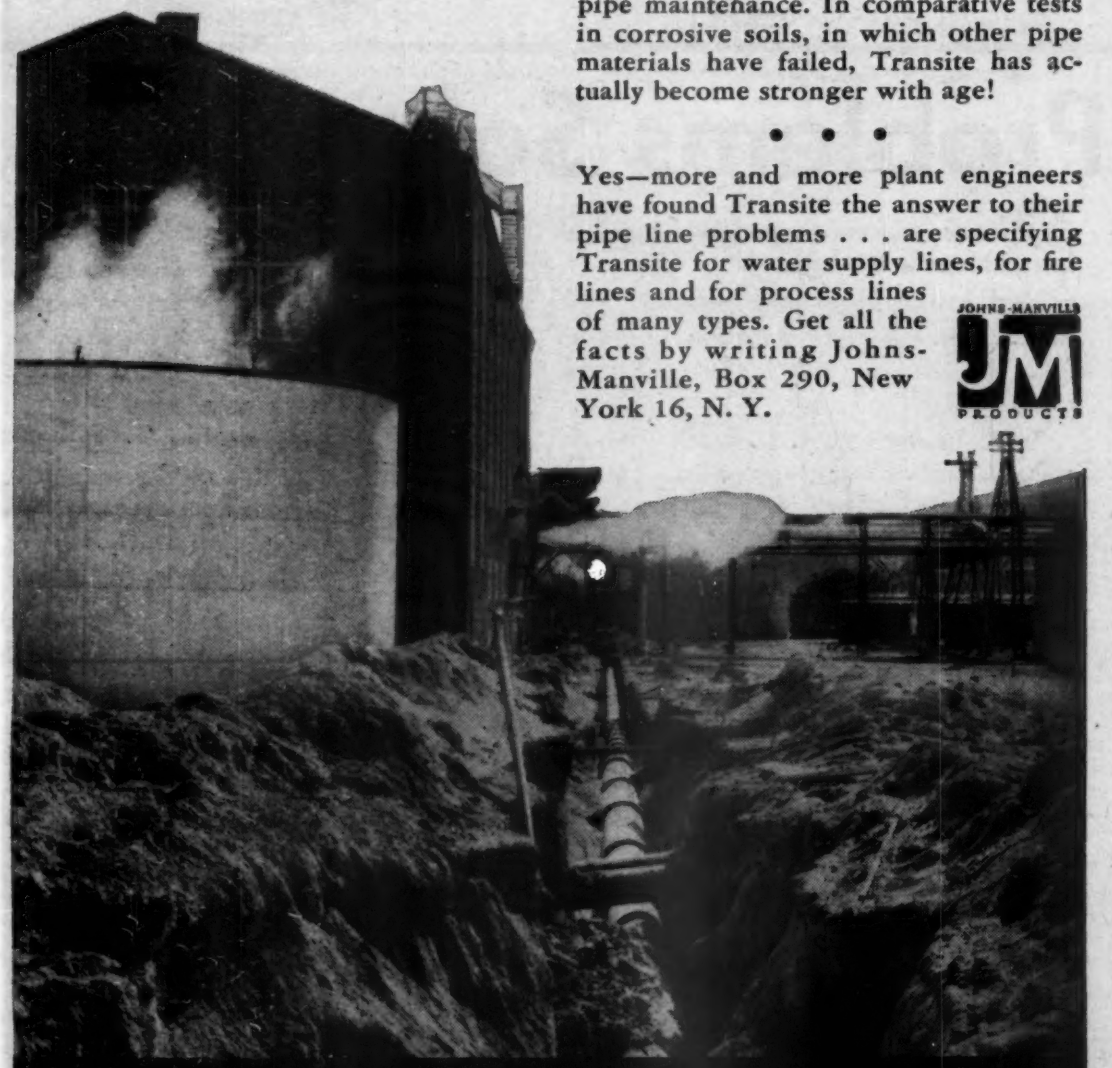

Johns-Manville

TRANSITE PRESSURE PIPE

An Asbestos Product

for Water Supply Lines • for Fire Lines • for Process Lines

BOOKS

60 YEARS WITH MEN AND MACHINES

FRED H. COLVIN. Whittlesey House, McGraw-Hill Book Co., 330 West 42nd St., New York 18. 297 pages. Photographs, sketches, index. $3.50.

Subtitled "An Autobiography," this book is a humorous running account of the author's experiences in the world of machinery, inventions, and production. While participating in the development of many of the mechanical devices now taken for granted, such as the bicycle, the automobile, airplane, and the modern railroad locomotive, he has known many of the foremost scientists, engineers, inventors, and industrialists.

Although his editorship of *The American Machinist* kept him in the editorial field for more than 30 years, his interests always extended beyond the field of machines and machine tools into labor relations, management, and the everyday problems of running a business or shop. Having started as an apprentice at the age of 15, still continuing his education at night school, he has come up through every aspect of machine shop activity, which has made his story of particular interest to all men who have an interest in machinery and machine tools.

CONSTRUCTIVE COLLECTIVE BARGAINING

EDWARD T. CHEYFITZ. Assistant to Eric A. Johnston, President, Motion Picture Association of America. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 161 pages. Appendixes A and B, index. $2.

One of the "Industrial Organization and Management Series." Written in non-technical style, this volume discusses methods of developing better employer-employee relations through application of democratic, humanized bargaining techniques. Using day-to-day industrial problems found in the average plant, the application of managerial techniques is discussed, and the role and responsibility of both management and union considered. Typical examples of successful methods used to maintain peaceful relations with labor and labor organizations are used to illustrate the points covered.

THE ALUMINUM CARTEL

LOUIS MARLIO. The Brookings Institution, 722 Jackson Place, N.W., Washington 6, D. C. 130 pages. Tables, graphs, charts, appendix, index. $1.50.

Based on the author's experience as former chairman of the Aluminum Cartel, this volume considers the following questions: Was international trade impeded by artifical market restrictions? Was expansion of the uses of aluminum restricted by the maintenance of artificially high prices? Did the comparative stabilization of prices in depression

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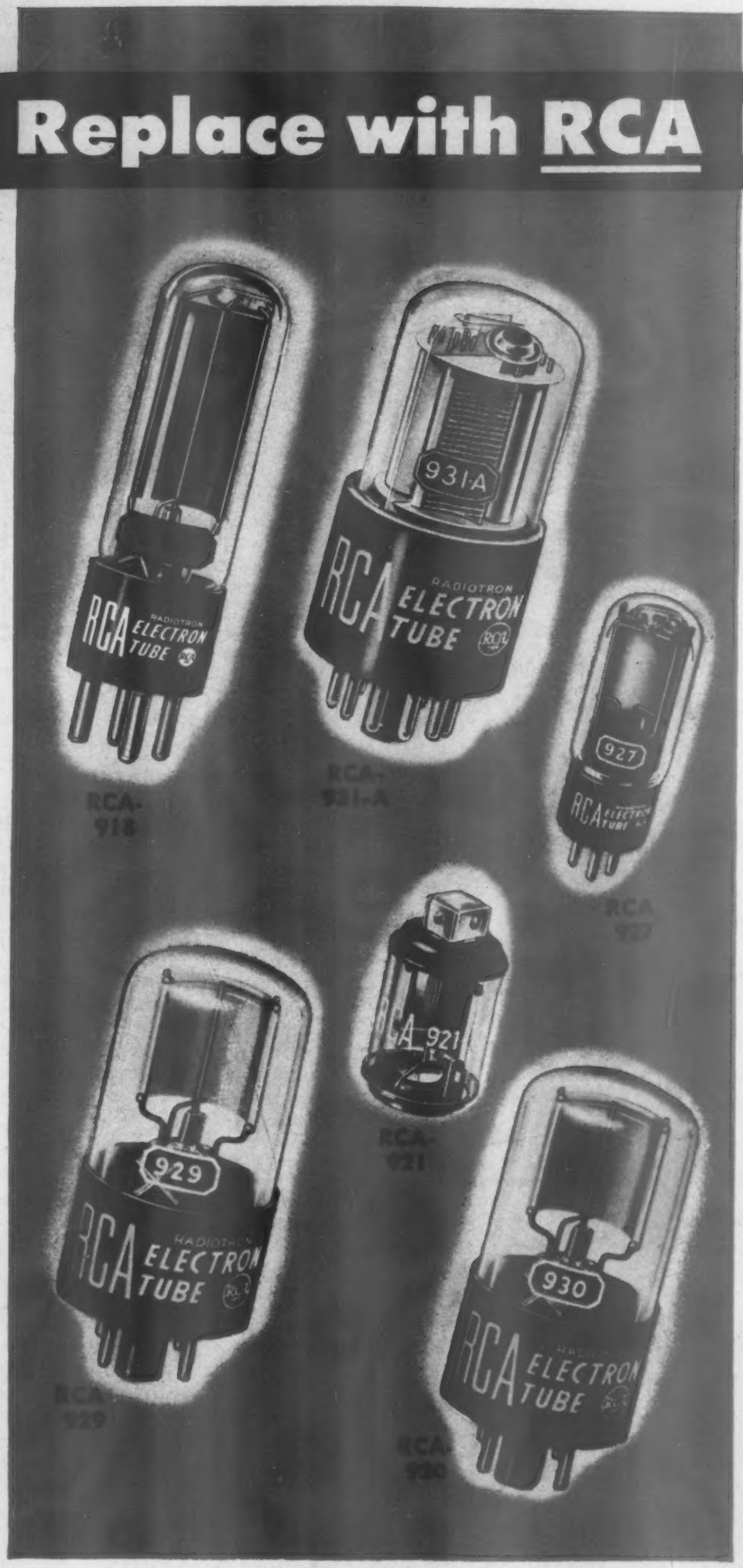

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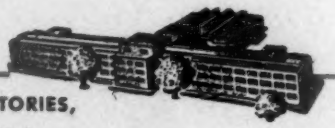

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IN RADIO AND ELECTRONICS—*THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA*

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

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BRING THE WORK TO THE TOOL

The U. S. LINE is so varied and comprehensive that production and maintenance are served with satisfaction both by the portable as well as the fixed position items in the great variety of practical tools.

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Ever since 1897 these tools have been an integral factor in the growth of industry . . . today they play an increasingly important part in present and future industrial planning.
LET THEM SERVE YOU, TOO.

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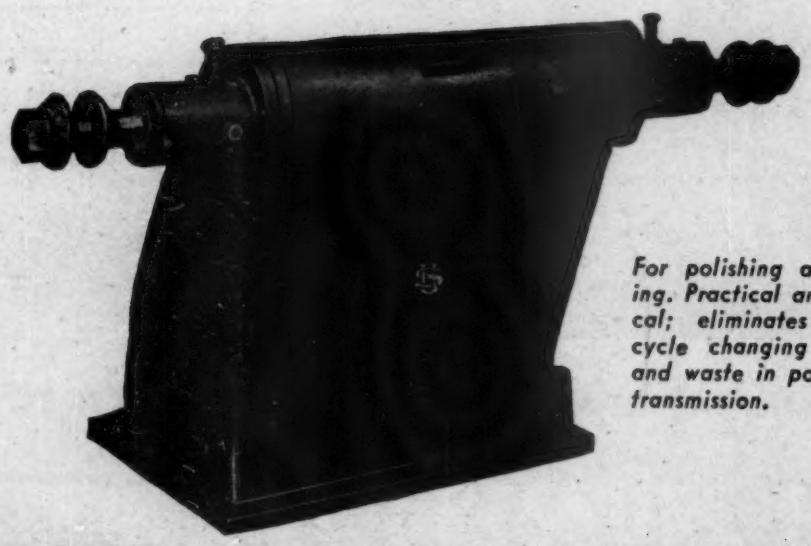

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periods impede general business recovery? Did the aluminum cartel retard technological progress? Did the cartel encourage inefficiency through protection of high-cost producers? Would government cartels bring price reductions? Dr. Marlio's answers to these questions endeavor to bring about a better understanding of a controversial problem.

FIRST INDUSTRIAL DIRECTORY OF MEXICO, 1947-48 EDITION

Publicaciones Rolland, S. de R. L., Plaza de la Republica No. 6., 407, Mexico, D. F. 1,024 pages. $20.

A directory of all Mexican industrial companies, their addresses, names of executive officers, list of raw materials used by each company, the products manufactured, capitalization, and number of workers employed. Since the directory is in Spanish, a Spanish-English dictionary of all terms used is included in the book.

THE PROBLEM OF REDUCING VULNERABILITY TO ATOMIC BOMBS

ANSLEY J. COALE. Princeton University Press, Princeton, N. J. 116 pages. $2.

This report, prepared for the Committee on the Social and Economic Aspects of Atomic Energy of the Social Science Research Council, endeavors to present in non-technical language a precise and straightforward analysis of the problems of atomic energy. The author examines the situation not only as it would appear under an effective agreement between nations, but also under an ineffective agreement or no agreement at all. He believes that the reduction of vulnerability as a means of discouraging attack can be recommended as an aid toward a stable agreement between nations.

LET'S BE HUMAN

JOHN L. BECKLEY; drawings by R. ROBERTS BALDWIN. Duell, Sloan & Pearce, Inc., 270 Madison Ave., New York 16. 122 pages. $2.50.

Subtitled "7 Steps to Increase Your Ability to Handle People." This volume contains more than 100 cartoons, each with a one- or two-line caption, depicting the art of handling people. The author, a specialist in management-labor relations for a public relations firm, presents seven rules which he himself found useful during the course of his wartime experience as the skipper of a PT boat.

APPLIED ENGINEERING MECHANICS

ALFRED JENSEN, Assistant Professor of General Engineering, University of Washington. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 316 pages. Sketches, figures, diagrams, tables, examples, appendixes A through E, index. $3.00.

An elementary text that meets the minimum requirements of a beginning course in mechanics. Divided into two parts: Statics and Dynamics. Practical

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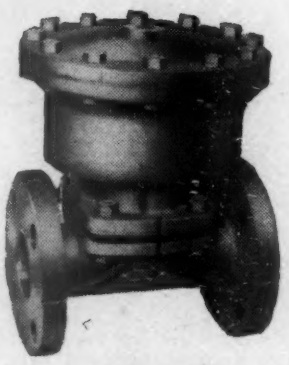

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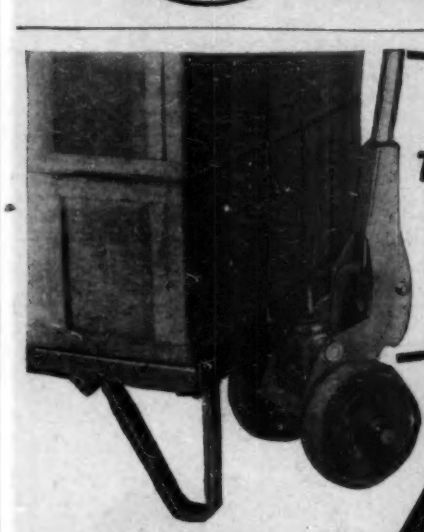

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FIG. 421, Standard Industrial Skid, 9 platform sizes from 24" x 48" to 42" x 72". Capacity 1800 lbs. Metal or Rubber Tired Wheels.

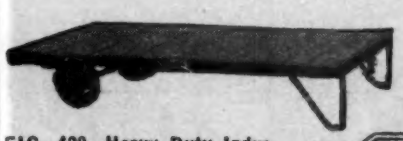

FIG. 420, Heavy Duty Industrial Skid, 9 platform sizes as above. Welded angle steel frame. Capacity 2800 lbs. Metal or Rubber Tired Wheels.

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problems commonly encountered are emphasized, and analytical and graphical solutions are presented side by side in order to show their close relationship. Mathematics has been held to a minimum.

ECONOMIC ROADS FOR AMERICAN DEMOCRACY

WILLIAM VAN TIL, Director of Learning Materials, Bureau for Intercultural Education, New York City. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 252 pages. Sketches, charts, references, index. $1.80.

Each of five economic theories now being presented to the American public is discussed in this book, first, in its bare outlines, then in more detail, with supporting quotations from the writings of specialists. No attempt is made either to advocate or discredit any of the competing theories. The author merely presents each one, and, by comparison, shows how they differ.

BOOKLETS

STEPPING STONES TOWARDS THE FUTURE. Arthur F. Burns, Director of Research. 27th Annual Report of the National Bureau of Economic Research, 1819 Broadway, New York 23. 91 pages. No charge for single copies.

HOW MUCH GOVERNMENT CAN YOU AFFORD? National Association of Manufacturers, 14 West 49th St., New York 20. 12 pages. Sketches. $2.30 per 100.

AMERICANS WON'T STAND FOR MONOPOLIES! National Association of Manufacturers, 14 West 49th St., New York 20. 16 pages. Sketches. $3.30 per 100 copies.

REPORTING TO EMPLOYEES AND THE PUBLIC ON PROFITS AND PRODUCTIVITY. Financial Management Series No. 88. American Management Association, 330 West 42nd St., New York 18. 43 pages. Sample reports, chart. $1.

ECONOMIC FUNDAMENTALS OF COLLECTIVE BARGAINING. Personnel Series No. 103. American Management Association, 330 West 42nd St., New York 18. 46 pages. $1.

TRAINING FOR MANAGEMENT SKILLS. Personnel Series No. 104. American Management Association, 330 West 42nd St., New York 18. 32 pages. 75c.

MANAGEMENT CONFERENCES—HOW TO RUN THEM. Waldo E. Fisher. Research Report No. 10. Industrial Research Department, Wharton School of Finance and Commerce, University of Pennsylvania, 3440 Walnut St., Philadelphia. 30 pages. Figure, appendix, bibliography. 50c.

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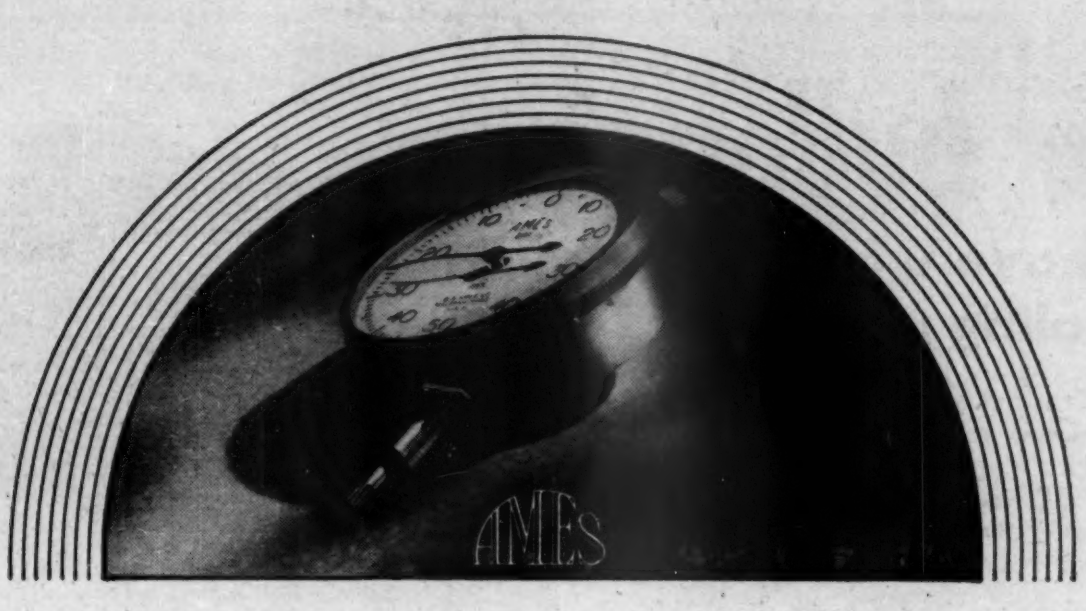

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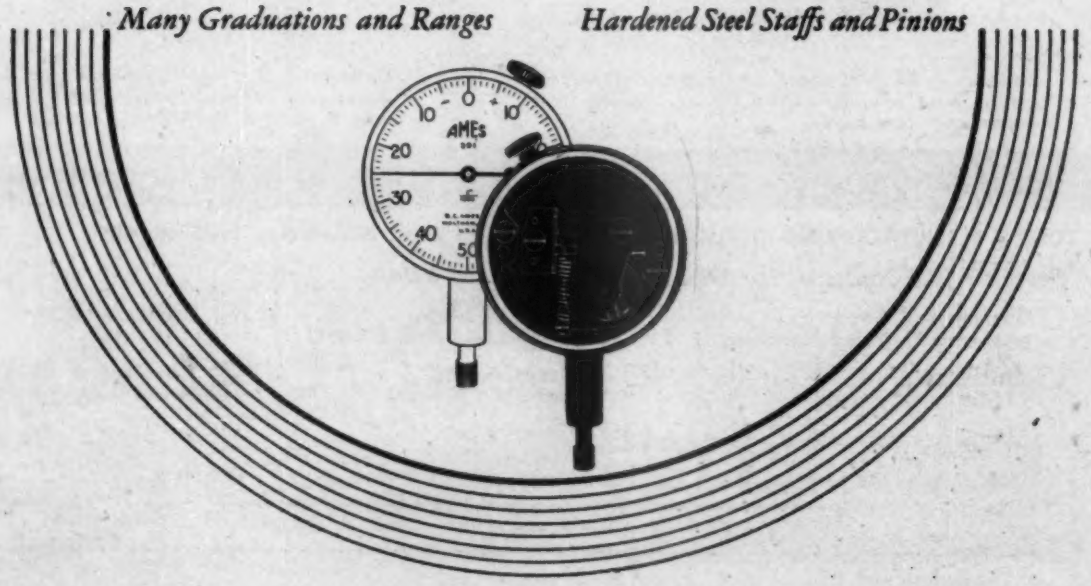

Commerce, University of Pennsylvania, 3440 Walnut St., Philadelphia. 80 pages. List of publications. $1.

RECORDS FOR THE CONTROL OF GROWING MANUFACTURING ENTERPRISES. Paul F. Lawler. Division of Research, Graduate School of Business Administration, Harvard University, Soldiers Field, Boston 63. 131 pages. Exhibits, appendix. $1.

JOBS IN INDUSTRIAL RELATIONS. A description of some of the principal industrial relations jobs in labor and business organizations. Philip H. Kriedt and Margaret Bentson. Bulletin 3. Industrial Relations Center, University of Minnesota, Minneapolis. 57 pages. Charts. 15c.

FACTS AND FIGURES ON GOVERNMENT FINANCE, 1946-1947. The Tax Foundation, 30 Rockefeller Plaza, New York 20. 144 pages. Sketches, tables, charts. No charge for single copies.

STRIKES AND DEMOCRATIC GOVERNMENT. A report by the Labor Committee of The Twentieth Century Fund, 330 West 42nd St., New York 18. 31 pages. 25c.

FIRE CONTROL—ITS EQUIPMENT, PERSONNEL AND PROCEDURES. National Conservation Bureau, Association of Casualty & Surety Executives, 60 John St., New York 7. 24 pages. 10c for single copies.

ON THE CALENDAR

JUNE

9-11, American Society of Refrigerating Engineers, Spring Meeting, Alexandria Hotel, Los Angeles. R. H. Money, President, 40 West 40th St., New York.

9-13, American Institute of Electrical Engineers, Summer Convention, Mount Royal, Montreal. H. H. Henline, Secretary, 29 West 39th St., New York.

11-12, American Management Association, General Management Conference, Waldorf-Astoria Hotel, N. Y. James O. Rice, Manager, 330 West 42nd St., New York 18.

15-18, National Association of Cost Accountants, Annual Meeting, Palmer House, Chicago. Arthur Gunnarson, Assistant Secretary, 385 Madison Ave., New York.

15-19, American Society of Mechanical Engineers, Semi - Annual Meeting, Stevens Hotel, Chicago. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.

16-20, American Society for Testing Materials, 50th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City.

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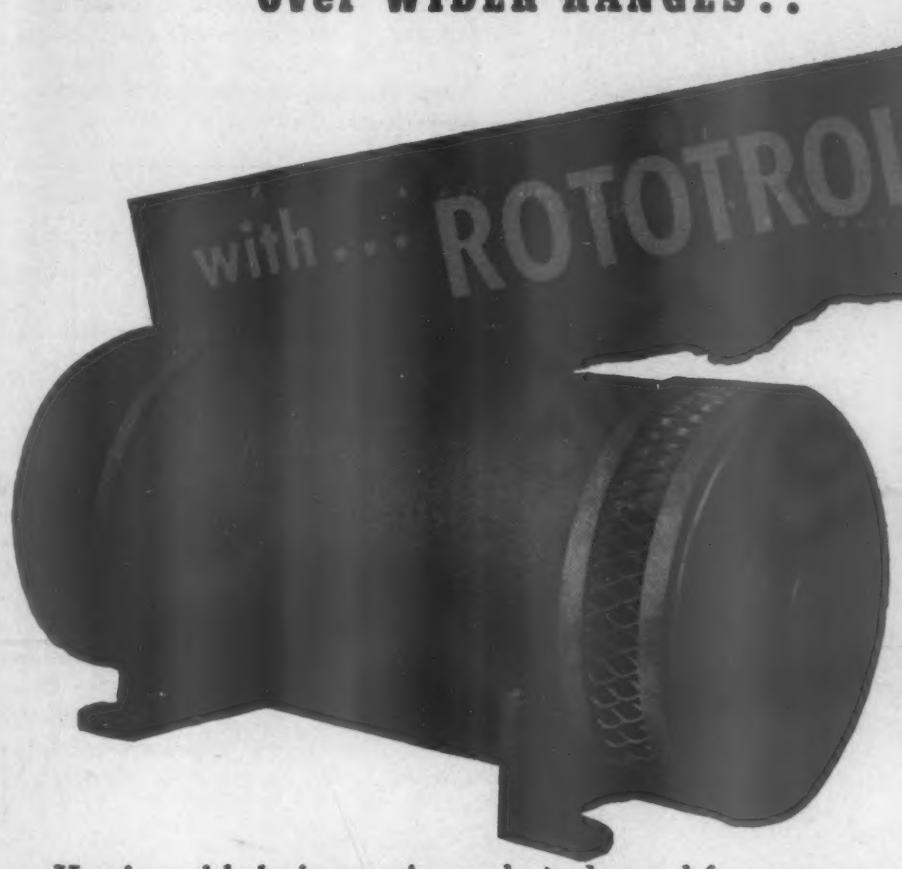

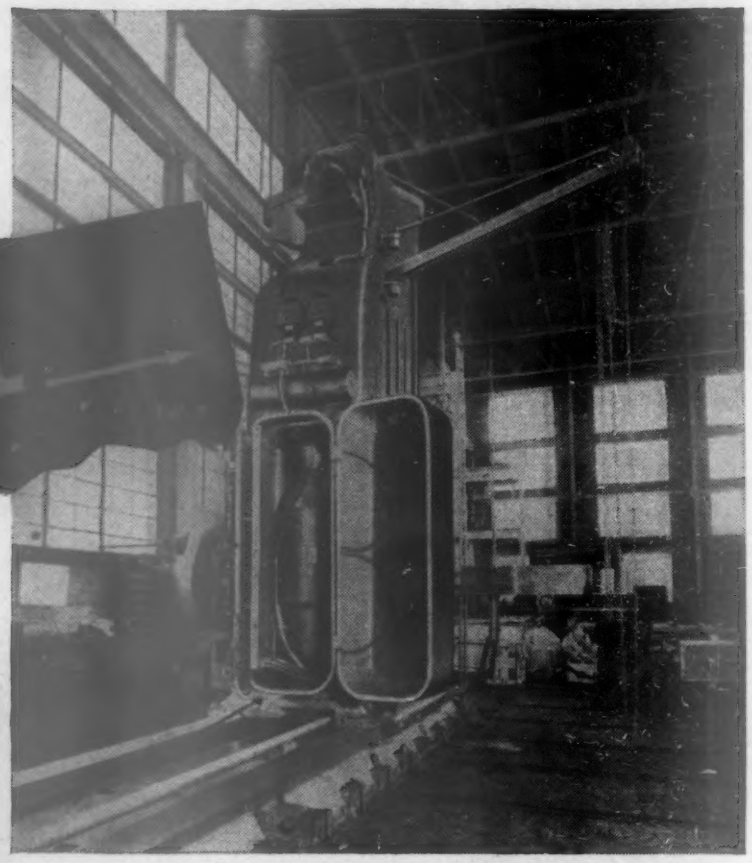

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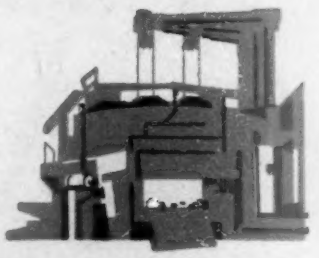

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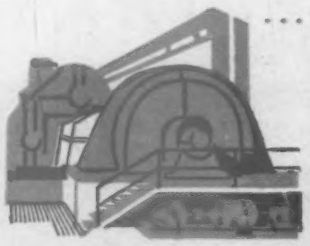

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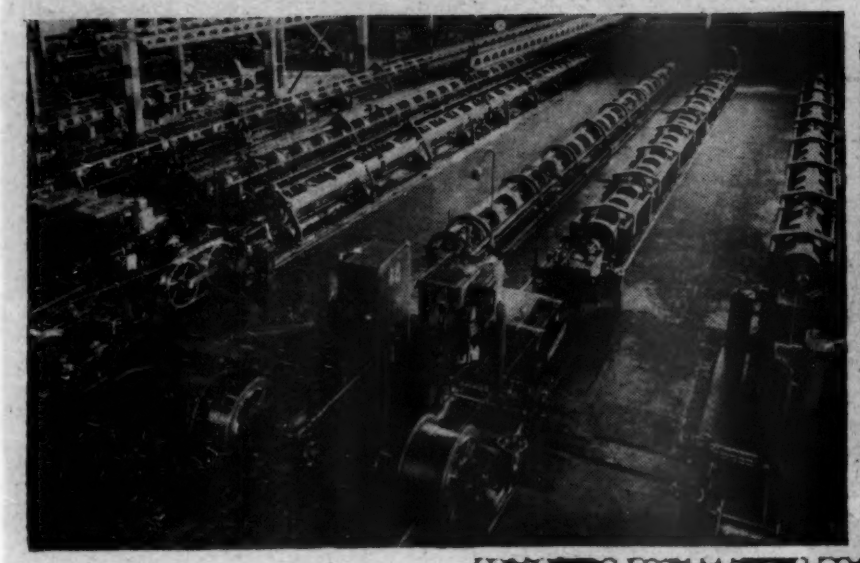

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Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

23-27, American Electroplaters' Society, Industrial Finishing Exposition, Convention Hall, Detroit. George L. Nankervis, General Chairman, 4484 Cass Ave., Detroit.

JULY

23-26, Silver Bay Conference on Industrial Relations, 29th Annual Conference, Silver Bay-on-Lake George, N. Y. William F. Meyer, Jr., Secretary for Industrial Services, 347 Madison Ave., New York.

AUGUST

26-29, American Institute of Electrical Engineers, Pacific General Meeting, San Diego Hotel, San Diego. H. H. Henline, Secretary, 33 West 39th St., New York.

SEPTEMBER

1-4, American Society of Mechanical Engineers, Fall Meeting, Hotel Utah, Salt Lake City. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York 18.

8-12, The Instrument Society of America, Second National Instrument Conference, Stevens Hotel, Chicago. Richard Rimbach, Executive Secretary, 1117 Wolfendale St., Pittsburgh 12.

15-19, Illuminating Engineering Society, Annual Conference, Hotel Roosevelt, New Orleans. A. D. Hinckley, Executive Secretary, 51 Madison Ave., New York.

15-19, American Chemical Society, Fall Meeting. Alden H. Emery, Secretary, 1155 Sixteenth St., N. W., Washington 6, D. C.

17-26, National Machine Tool Builders' Association, Machine Tool Show, The Dodge-Chicago Plant (now the Tucker Corporation Plant), Chicago. Tell Berna, General Manager, 10525 Carnegie Ave., Cleveland.

22-25, Association of Iron & Steel Engineers, Annual Convention, Hotel William Penn, Pittsburgh. T. J. Ess, Managing Director, Empire Building, Pittsburgh.

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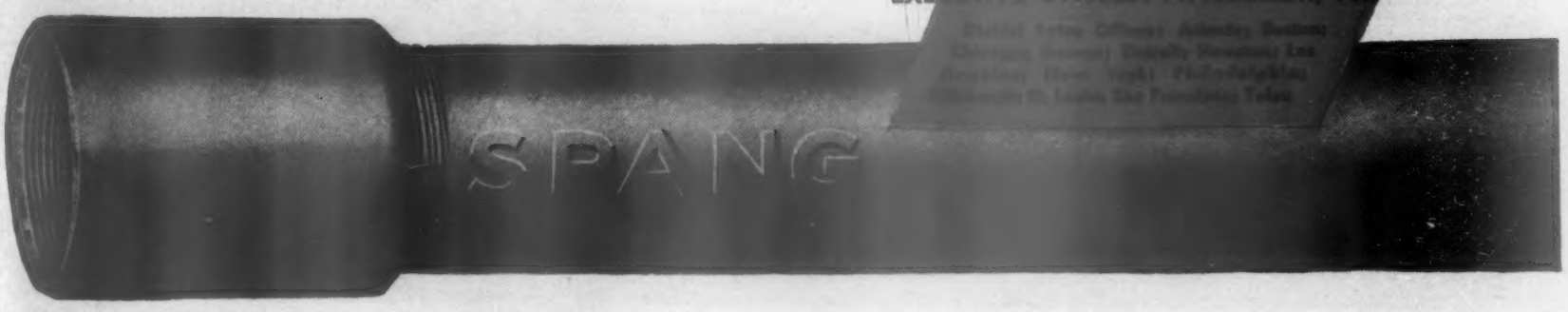

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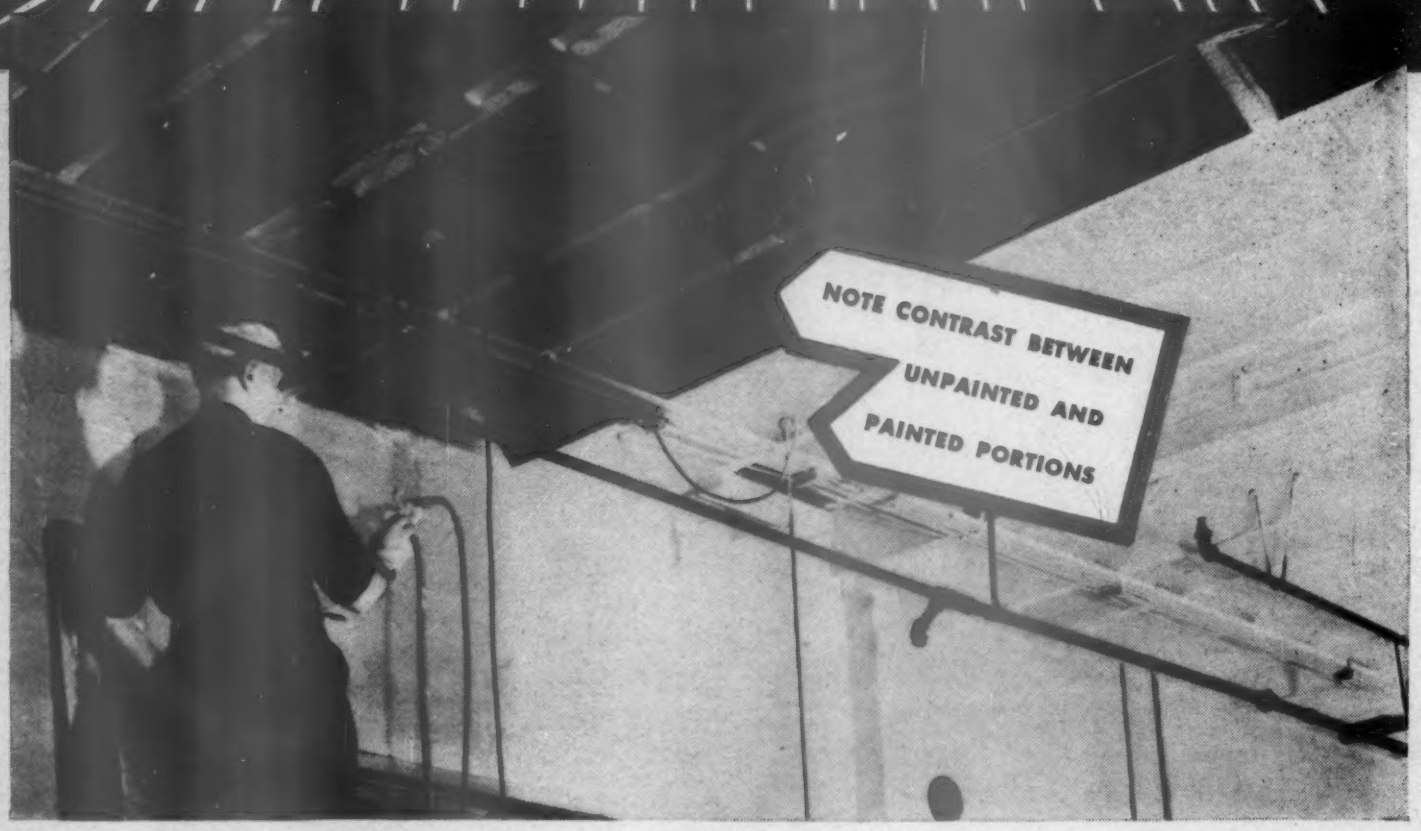

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☐ You may have your representative call and demonstrate SPRAY-DAY-LITE in our premises without obligation on our part.

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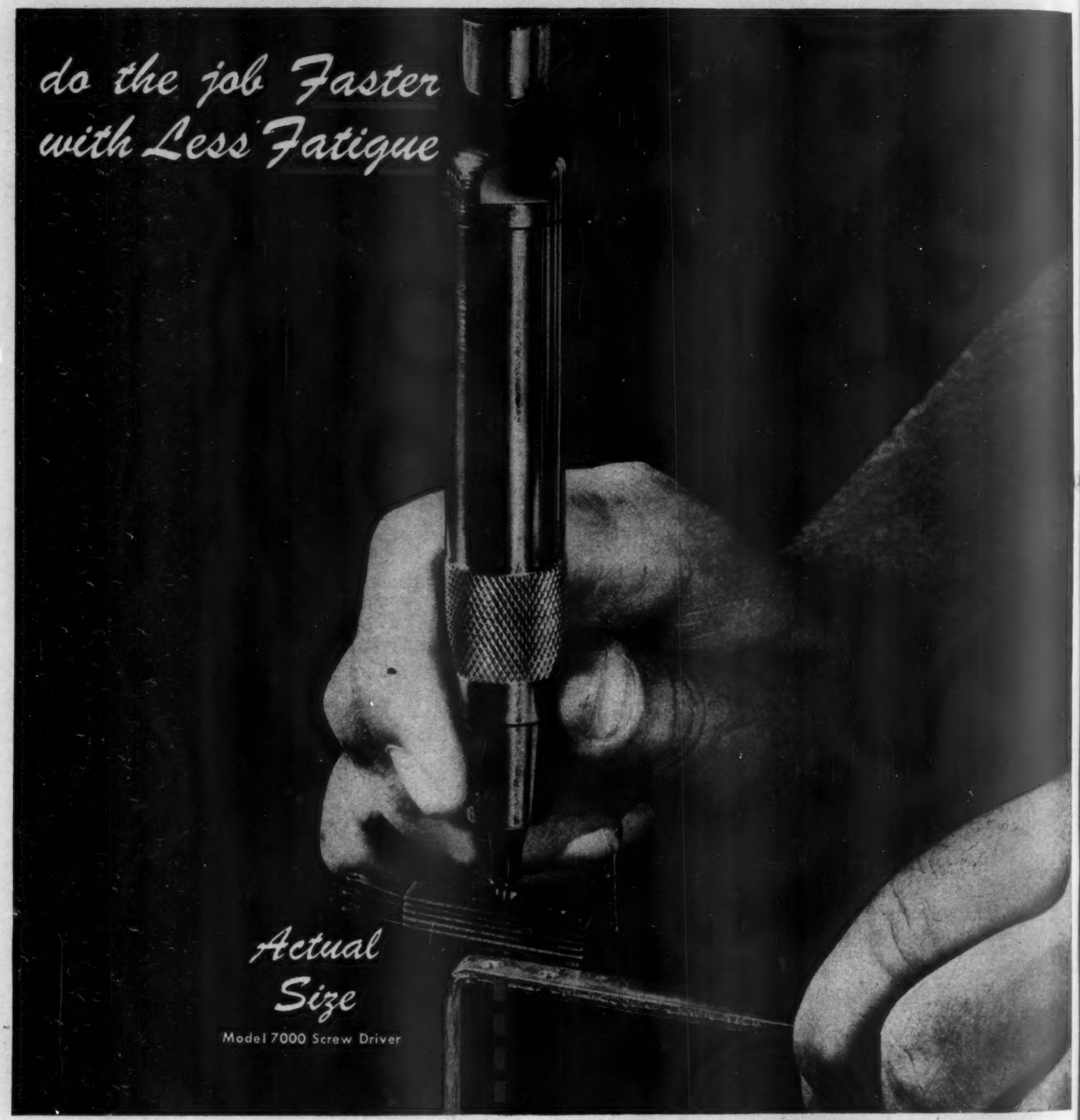
AIR TOOLS



● There's a job-engineered Air Tool by ARO for a wide range of assembly work . . . screw-driving, nut-setting, drilling, grinding and similar operations. These tools give a real lift to production—they're speedy, powerful, light-in-weight, and thoroughly dependable. Precision-built to do the job better and faster . . . with trouble-free performance! Write for catalog. See your ARO Jobber. The Aro Equipment Corp., Bryan, Ohio.

by ARO

The Horse who Lived the Life of Reilly!

by Mr. Friendly

One day, Mr. Reilly, President of Reilly, Inc., decided to change places with his horse, Walter. "No worries," he said, "about industrial accidents, lawsuits, low production . . . nothin' to do all day but eat, sleep and gallop!"

Well . . . Walter, who was sick of hay . . . simply leaped at the chance!

Time passed . . . and Walter became neurotic. He started biting his hoofs . . . he kicked the production manager whenever he saw him.

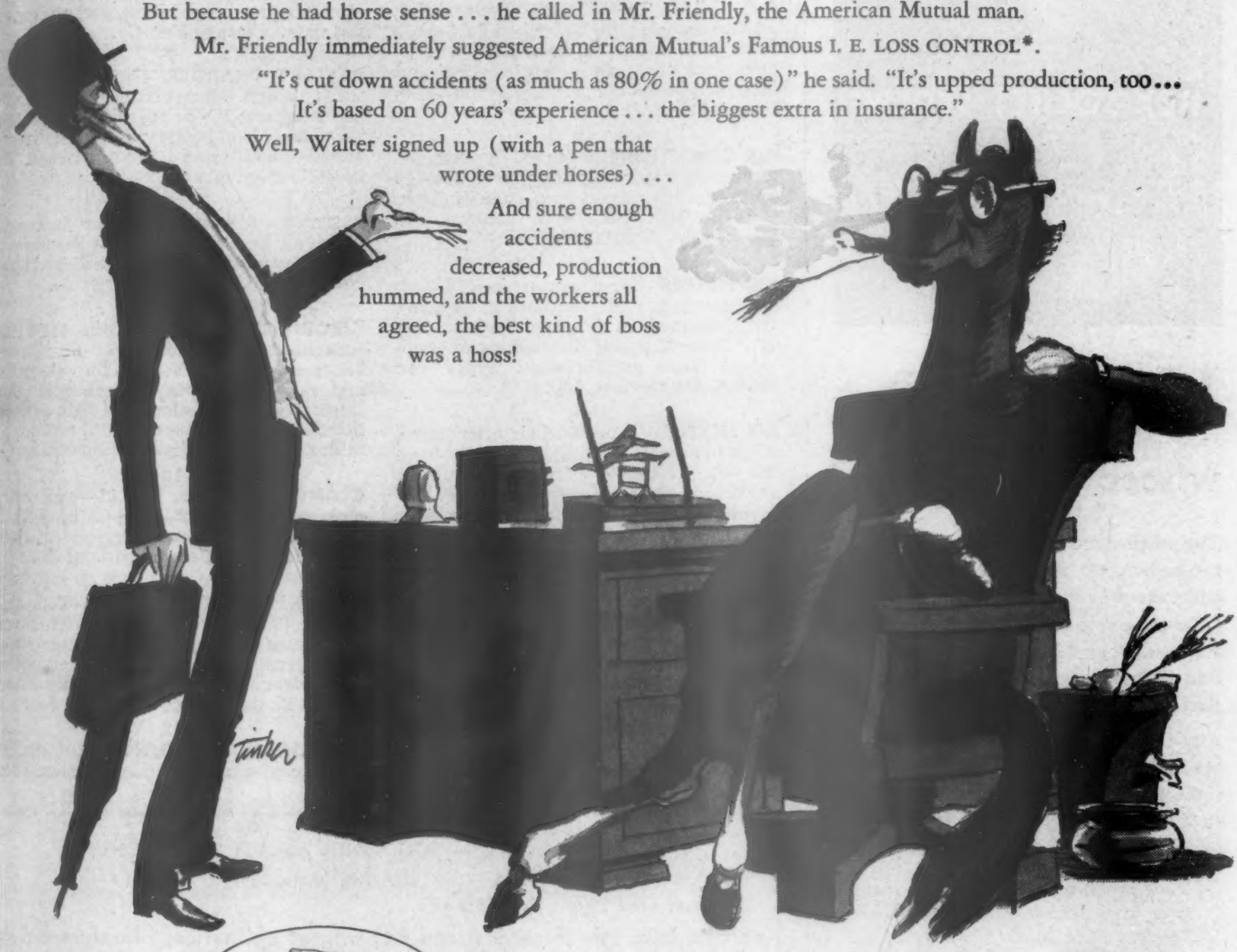
But because he had horse sense . . . he called in Mr. Friendly, the American Mutual man.

Mr. Friendly immediately suggested American Mutual's Famous I. E. LOSS CONTROL*.

"It's cut down accidents (as much as 80% in one case)" he said. "It's upped production, too... It's based on 60 years' experience . . . the biggest extra in insurance."

Well, Walter signed up (with a pen that wrote under horses) . . .

And sure enough accidents decreased, production hummed, and the workers all agreed, the best kind of boss was a hoss!



Your helping hand when trouble comes!

A M

AMERICAN MUTUAL

the first American liability insurance company

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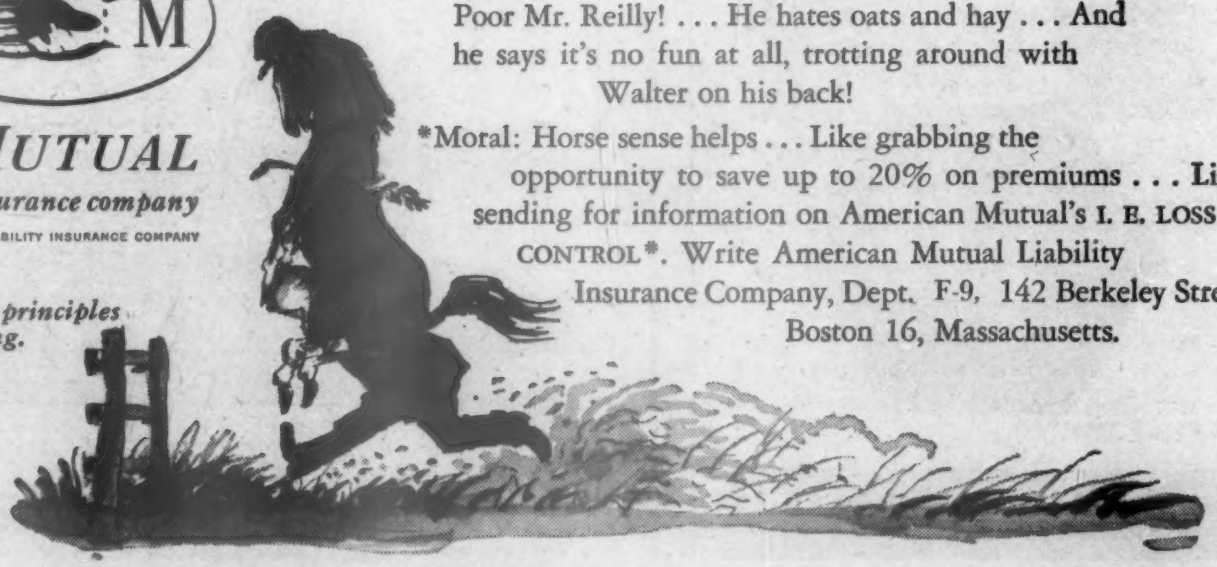
**Accident prevention based on principles of industrial engineering.*



Poor Mr. Reilly! . . . He hates oats and hay . . . And he says it's no fun at all, trotting around with Walter on his back!

Moral: Horse sense helps . . . Like grabbing the opportunity to save up to 20% on premiums . . . Like sending for information on American Mutual's I. E. LOSS CONTROL. Write American Mutual Liability Insurance Company, Dept. F-9, 142 Berkeley Street Boston 16, Massachusetts.

Handiest

where *hard-to-hold*

The small-size screws you so largely use can be held on the end of an Allen driver and started in the tapped hole instanter! Or they may be held on an Allen Hex Key and turned in places where thumb-and-finger work awkwardly if at all. *Fast in assembling!*

And for set-ups hard to hold under vibration, "Allens" have (1) STRENGTH for tight wrenching; (2) Accurate threading to a high Class 3 fit, for a high degree of frictional holding-power.

Your local Industrial Distributor supplies also Allen Socket Head Cap Screws, Flat Head Cap Screws, "Tru-Ground" Shoulder Screws and "Tru-Ground" Dowel Pins. Ask him for samples or demonstration.

THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

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A.C. LOAD VISUALIZER—Type AF-1, and accessories are described in 4-page form GEA-4784. Explains design, uses, operating principle and procedure, and includes specifications. Apparatus Dept., General Electric Co.

2
AIR CONDITIONERS—made in packaged units ranging in capacity from 3 to 15 tons, are introduced in 4-page Bulletin C-64-F. Discusses uses, features, and dimensions. Curtis Mfg. Co.

3
AIR FILTERS—for warm air heating, air conditioning, and ventilating systems, are described in 12-page Bulletin FM 101. Structure and dimensions of individual and prefabricated types are shown. Air Devices, Inc.

4
AIR FILTERS—Type P-18 air filter panel, made in models ranging in capacity from 320-640 to 500-1000 c.f.m., is the subject of Form P-18. Four-page folder No. IKP covers metal Kleenflo air filter panels for air conditioning and ventilating systems. Air-Maze Corp.

5
AIR HOSE—Specifications and construction features of Monarch air hose for heavy-duty air tool and compressor use, are outlined in illustrated folder. Hewitt Rubber Div., Hewitt-Robins, Inc.

6
AIR WASHERS—for humidification, cooling, cleaning, and dehumidification, are treated in 16-page Bulletin 120, Edition No. 2. Consists of details on applications, sizes, structure, operation, and engineering data. Clarage Fan Co.

7
BATTERY CHARGER—Bulletin 210 features a single-circuit battery charger for servicing one 15- or 16-cell, 350- to 500-amp.-hour lead battery. Includes dimensional diagram and table of ratings. The Electric Products Co.

8
BLOWER—constructed for use with warm air heating systems, is the topic of 4-page pamphlet. Cutaway view shows construction. The Brundage Co.

9
CIRCUIT BREAKERS—Bulletin 71B6179B contains information on oil circuit breakers, Type DZ-40B, for electrical and manual remote control operation. Describes construction, and lists protection features, accessories, and includes a table of ratings. Allis-Chalmers Mfg. Co.

10
CLAMPS, CHISELS, DRILLS—and other tools are listed in 36-page Catalog 39-D. Includes illustrations, descriptions, sizes, and prices. The Cincinnati Tool Co.

11
CLEANING COMPOUND—Technical Data Bulletin A-447 introduces Mulsirex, an emulsifying type cleaning compound for use with kerosene and other petroleum cleaning products. Provides information on use. Turco Products, Inc.

12
CLUTCH AND COUPLING—Bulletin 231, 6 pages, explains construction and

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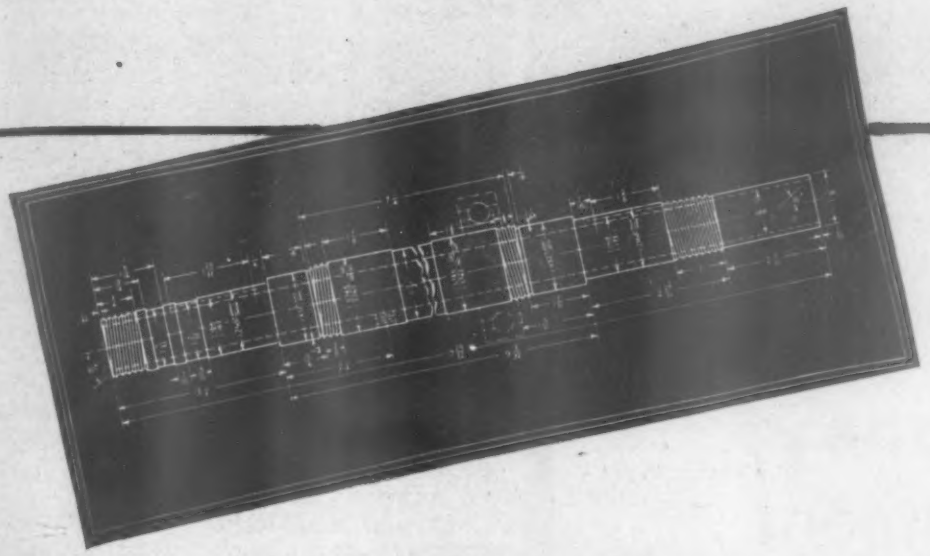
The Steel Tube "Headache" that Multiplies Itself



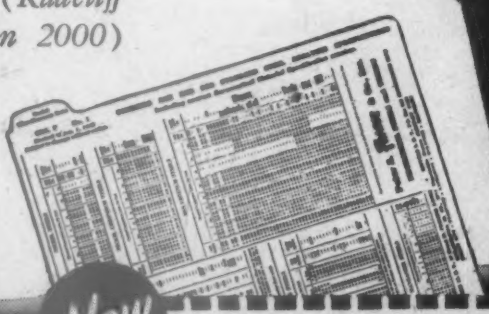
Courtesy Petroleum Heat & Power Co.

TO MAKE this "Petro" oil burner shaft, a seamless steel tube is turned and ground to 17 separate diameters. It's threaded, tapped, chamfered and keywayed—all to close tolerances.

The cost of making this finely balanced shaft (8 times that of the raw material) makes rejection of a finished part highly expensive. Hours of skilled labor might be spent on material later found defective—while the cost headache multiplies with every wasted man hour.

Frasse tubing has been successfully used by the manufacturer in this rigid application for years. If you're interested in cost reducing (and who isn't these days) you'll find tubing of the selfsame quality in any Frasse warehouse.

Frasse stocks include seamless and welded mechanical tubing, aircraft, condenser and pressure tubing, and stainless steel tubing and pipe. Complete range of sizes and grades to choose from—shipment made overnight. Call us. *Peter A. Frasse and Co., Inc., 17 Grand Street, New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Avenue, Philadelphia 29, Pa. (Radcliff 5-7100) • 50 Exchange Street, Buffalo 3, N. Y. (Washington 2000) Jersey City • Syracuse • Hartford • Rochester • Baltimore*



New

Latest Frasse Data Chart shows up-to-date analyses specs for all standard steels. Gives AISI number, analyses of each steel and corresponding SAE and AMS numbers. Invaluable to steel users—mail coupon for free copy today.

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operating characteristics of an overrunning clutch and coupling. Lists dimensions and speeds, and includes diagrams. The Hilliard Corp.

13

COMBUSTION CONTROL SYSTEM—providing electronic monitoring of oil or gas flame, programming control for ignition systems, and boiler water level control, is treated in 4-page illustrated Bulletin 604. Combustion Control Corp.

14

CONDENSING AND COMPRESSOR UNITS—ranging from 3- to 14-cylinder models, are pictured in leaflet. Features are listed, and dimensions tabulated. Airtemp Div., Chrysler Corp.

15

CONNECTORS—for electric circuits are featured in 76-page book. Photographs depict use on different types of equipment. Cannon Electric Development Co.

16

CONVEYORS—that are portable, gravity roller type, called Port-A-Flow, are set forth in 4-page folder. Features are discussed, and different types of installations are pictured. Alvey-Ferguson Co.

17

CONVEYORS—of different types, pneumatic dispatch tubes, and trayveyors for cafeterias, are depicted in 4-page Form 746. Lamson Corp.

18

COUNTING, TIMING, AND RECORDING UNITS—for different applications are cataloged in 8-page Form 52. Provides photographs, specifications, and prices. Production Instrument Co.

19

CRANE—Mobile Swing-Boom crane, which operates on or off tracks, is depicted in 6-page Bulletin 68. Construction, operation, applications, dimensions, and specifications are covered. Silent Hoist & Crane Co., Inc.

20

DEHUMIDIFIER—known as DryNamic, for maintaining dry air or for use as a ventilation system, is explained in 4-page folder. Describes operation, and provides engineering data. Cargocaire Eng. Corp.

21

DOOR INTERLOCK SWITCH—that breaks the power circuit when access doors are opened, is the subject of leaflet. Discusses applications, features, and includes drawing showing dimensions and connection. Electronics Dept., General Electric Co.

22

DRILLING MACHINES—24- and 28-in., and accessories are announced in 4-page Catalog 66. Discusses design, features, and specifications, and pictures the machines. Sibley Machine & Foundry Corp.

23

DUST COLLECTORS—for grinding, buffing, and polishing operations, are discussed in illustrated circular. Breuer Electric Mfg. Co.

24

ELECTRONIC CONTROLS—Condensed Catalog Z-6400, 20 pages, supplies details on measuring and control systems, the "electronic control principle," Multronic proportioning, automatic positioning, and program control. Includes graphs, photographs. Wheelco Instruments Co.

25

ELECTRONIC EQUIPMENT—including electronic heating sets and electronic control, is cataloged in 44-page booklet

ALL THE GOOD NEWS COMES FROM PRODUCTION EFFICIENCY

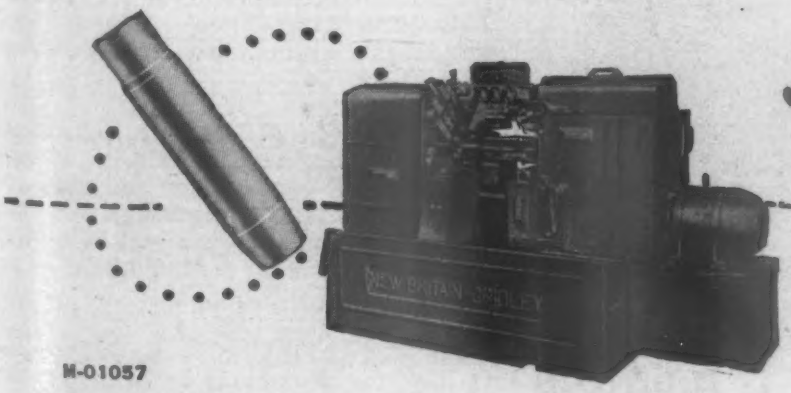
PAYING for higher wages and maintaining profits by raising prices is a sure formula for stagnation.

Lowering prices at the expense of wages or earnings on investors' savings produces the identical result.

Lower *costs*, resulting from *greater manufacturing efficiency*, is the answer. Here is something management and labor agree on wholeheartedly. But you don't *get* it by agreeing about it.

Engineers, by designing new automatic machines, new tools, and new set-up methods, have offered the key to solving the problem. It's up to management to make these better machines and methods available. It's up to the man at the machine to use that machine for all it's worth.

EXAMPLE: Formerly a leading automotive manufacturer found it necessary to rough grind the O.D. of this valve stem guide, machine the I.D. and then finish grind the O.D. Today the outside diameter is finish ground before being magazine fed into a Model 60 New Britain screw machine, which turns out over 406 pieces per hour with concentricity between inside and outside diameters well within the required .002 total indicator reading. Here is a sound saving, which, repeated in thousands of thousands of parts makes an important contribution to lowered costs.



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New Britain Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

When Trouble Hits the Ceiling

Water vapor condensing on roof members causes trouble aplenty if building materials used there can't stand moisture. Upkeep costs skyrocket.

Use Wolmanized Lumber* and another of your worries disappears. It's standard structural lumber, pressure-impregnated with Wolman Salts* preservative, making it highly resistant to decay that's fostered by the presence of moisture.

FOR FLOORS, TOO

You head off decay, reduce maintenance costs, by setting your floor on Wolmanized Lumber subflooring and nailers.

*Wolmanized Lumber gives the builder all of wood's advantages—speed of erection, light weight, resilience, high insulating value, paintability, low first cost—plus long life.

*Registered trademarks

1676 McCORMICK BUILDING, CHICAGO 4, ILLINOIS

No. B-3610. Contains application data, performance curves, and selection charts. Westinghouse Electric Corp.

26

FANS—Catalog X5749, 26 pages, consists of design and construction specifications, performance, and dimensional data on different types of fans and accessories. The Emerson Electric Mfg. Co.

27

FEEDER DRIVE—Bulletin EF-146 deals with Type 2520 heavy-duty variable speed feeder drive. Construction details are illustrated, and dimensional drawing shows screw conveyor feeder installation. Sprout-Waldron & Co.

28

FIRE ALARM SYSTEM—called Fire Detective, which automatically sounds a warning when temperature exceeds 140 degrees, is depicted in 12-page brochure. Dictograph Products, Inc.

29

FLEXIBLE COUPLING—Structural information on flexible couplings, tables on horsepower ratings, details on standard misalignments, and service factors are compiled in 8-page booklet. Brownstein Mfg. Co.

30

FLEXIBLE METAL HOSE—and the "science of Flexonics" (the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration, and corrosion) are discussed in Catalog G-47. Chicago Metal Hose Corp.

31

FLOOR BOXES—and accessories are presented in 12-page Catalog FB147-22. Describes and illustrates watertight floor boxes and receptacles, combination floor extension sets, floor outlet type receptacles, plugs, and other equipment. Russell & Stoll Co., Inc.

32

FLOOR REPAIR MATERIAL—known as Pak-Tamp, is the topic of broadside illustrating application. Paramount Industrial Products Co

33

FLUORESCENT LAMPS—Daylight, 3500-deg. white, soft-white, and 4500-deg. white fluorescent tubes are described in 4-page Form 107. Outlines applications and features. Lustra Corp. of America.

34

FUSES—"Time Delay" renewable fuses and renewal links are described and illustrated in 16-page catalog. Furnishes data on sizes, and time delay curves for 250- and 600-volt fuses. Economy Fuse & Mfg. Co.

35

GAS AIR CONDITIONERS—for all-year use, to humidify, clean, and circuate the air automatically, maintaining temperature at predetermined level, are set forth in Form APR-723R2. Servel, Inc.

36

GAS PRESSURE REGULATORS—for appliances are introduced in Bulletin GPR-146. Sizes, capacities, weights, and dimensions are included. American District Steam Co.

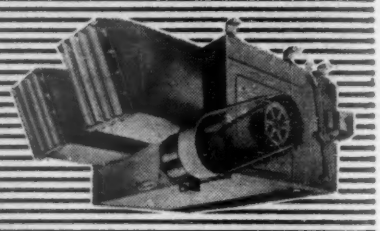
37

GEARS—double helical type, are treated in 12-page booklet No. 1958-A. Photographs depict construction and components, as well as applications. Outline dimensions are sketched and tabulated. Worthington Pump & Machinery Corp., Moore Steam Turbine Div.

38

GERMICIDAL FIXTURES—called Protect-O-Ray, for protection against airborne

Carrier 46E (horizontal type) Unit Heaters in cafeteria of the Montgomery Ward Company, Chicago, Illinois. Temperature is brought up to desired level within a few minutes. Carrier horizontal and vertical Unit Heaters have capacities up to 500,000 Btu per hour.



Carrier 46R suspended Heat Diffuser. Designed for larger commercial and industrial buildings. One of three types available, with capacities up to 1,500,000 Btu per hour, with or without Thermadjust control.

cold's easy to lick when heat is quick

You get heat fast with Carrier Unit Heaters. These skilfully engineered standard units supply quick heat to every nook and corner of your space. And they do it at low fuel cost.

Carrier Unit Heaters are designed for smaller plants and plant cafeterias, supermarkets, bowling alleys and other types of industrial and commercial buildings. Advanced design permits close temperature control. Quality construction assures years of dependable service and economical maintenance.

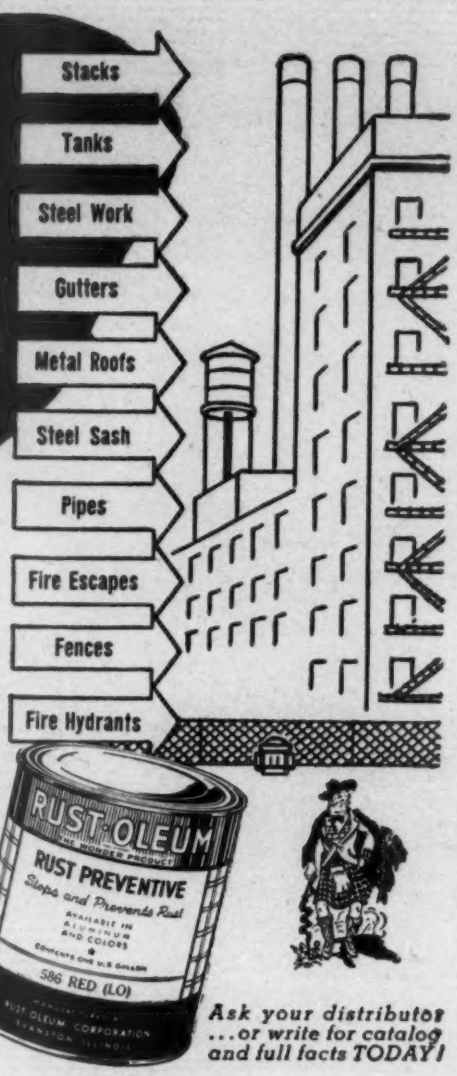
Units are available for either horizontal or vertical discharge. In the horizontal type adjustable louvers afford directional air control. The vertical type discharges heated air from two, three or four sides plus directional air flow by means of adjustable louvers.

Like every Carrier air conditioning, refrigeration and industrial heating product, these Unit Heaters bear the stamp of Carrier's unrivaled research and engineering experience. This is a *plus advantage* you get only with Unit Heaters that carry the Carrier name. Carrier Corporation, Syracuse, N. Y.

Carrier

air conditioning
refrigeration
industrial heating

STOP RUST
—and at lower cost with
RUST-OLEUM



Rust-Oleum is a positive rust preventive. Prepared with scientifically-processed fish oil, it's available in a variety of colors for every industrial use.

Rust-Oleum can be applied directly over *rusting metal*—by brush, dip or spray. No sand-blasting or chemical "dissolvers" are necessary. Simply wire brush surface to remove dirt, scale, etc.

Rust-Oleum covers 30% more area per gallon . . . goes on 25% faster . . . *outlasts ordinary paints two to ten times.* This means lower maintenance cost on every job.

Ask your distributor . . . or write for catalog and full facts TODAY!

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How To Strike A "Hard" Bargain!

When it comes to a floor treatment, the one that lasts the longest . . . the one providing the *hardest finish* . . . is naturally the biggest *bargain* in the long run.

That's the reason so many maintenance men are turning to non-slippery Car-Na-Lac and Continental "18." These high quality floor treatments provide an extra hard, non-tacky finish that resists grinding-in of dirt and grime . . . floors stay clean up to 30% longer. Tracking-off is reduced to a minimum, also.

Yes, when correctly applied, Car-Na-Lac and Continental "18" adhere as though "welded" to the floor . . . thus longer wearing with savings resulting from fewer applications.

CONTINENTAL CAR-NA-VAR CORP.
1632 E. National Avenue
Brazil, Indiana
Specialists in heavy duty floor treatments

CUT THE OVERHEAD UNDERFOOT WITH CAR-NA-VAR FLOOR TREATMENTS

CAR-NA-LAC LACQUER-LIKE FLOOR FINISH

CONTINENTAL "18" THE SUPER FLOOR FINISH

Approved by Rubber Flooring Manufacturers' Ass'n.

germs, are discussed in 4-page folder No. 104. Lustra Corp. of America.

39

GOGGLES, FACE SHIELDS—and a goggle cleaning cabinet are described and illustrated in Bulletins CE-29, CN-1, and CE-28 respectively. Mine Safety Appliances Co.

40

GUMMED TAPE MOISTENER—Bulletin 17 deals with Tape-Tack, a gummed tape moistening solution. Contains description, discusses properties, preparation, and uses. Paisley Products, Inc.

41

HAND CRANES—Bulletin 1000-A, 27 pages, illustrates different types of hand cranes. Describes safety factors, construction, capacity ratings, and unit and replacement parts. Provides engineering drawings and specifications. Downs Crane & Hoist Co.

42

HAND TRUCK—called Hi-Boy, is introduced in 4-page pamphlet. Tells about construction, use, and lists prices. Bond Foundry & Machine Co.

43

HAND TRUCKS—of tubular steel, with pneumatic tires, are pictured handling different types of loads in 4-page Form 1146. Outlines features and specifications. Moellenbrock & Wilke.

44

HAND TRUCKS—as well as steel bench legs, dollies, wheels, and casters, are introduced in 8-page Booklet 47-A. Covers uses, sizes, and prices. Morse Metal Products Co., Inc.

45

HEAT EXCHANGER—for heating or cooling corrosive solutions, is the topic of Bulletin 1610. Cutaway picture shows structure, and diagrams contain dimension data. The Duriron Co., Inc.

46

HEATERS—Direct fired heaters (gas or or oil fired) are treated in 4-page Bulletin 801-A. Floor models as well as horizontal and inverted suspension types are set forth. Tables give ratings and dimensions. Airtherm Mfg. Co.

47

HEATERS—Construction and operation of vertical tubular steel furnaces adaptable to oil, stoker, or hand firing are explained in 4-page Bulletin 783-C. Stainless & Steel Products Co.

48

HEATING COILS—Type F Non-Freeze heating coil, for steam pressures to 200 pounds gage, is described and illustrated in 22-page technical Bulletin 44 N.F An 18-page booklet, No. C.T. 39-1, provides engineering data on continuous tube water coils for heating and cooling. Aerofin Corp.

49

HEATING AND PLUMBING UNITS—Details on relief valves, air venting valves, and floor and ceiling plates are compiled in Catalog 46. Sectional view shows valve interior, and installation drawings, specifications, and prices are supplied. The Beaton & Cadwell Mfg. Co.

50

HEATING UNIT—known as Console Model 60, is depicted in illustrated leaflet. Features are listed, and technical information is included. Hot Boy, Inc.

51

HEATING, VENTILATING, AND AIR CONDITIONING PRODUCTS—including Texrope V-belts and drives, centrifugal

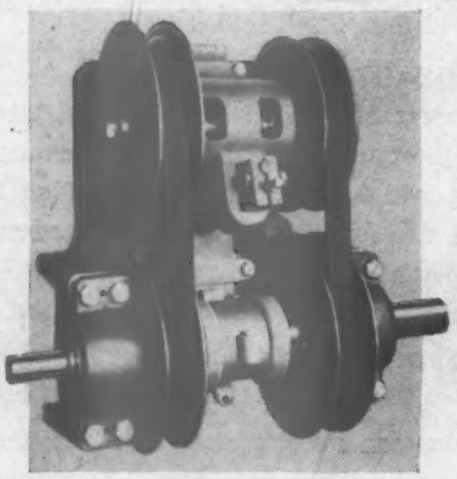
2.8 to 7½ hp
2 to 5 hp
1 to 3 hp
¼ to ¾ hp
SELECTORS JOIN THE WORTHINGTON VARIABLE SPEED DRIVE FAMILY
MODEL E: 2.8 to 7½ hp; ratio 6 to 1; speed range 400/2400 (with 1725 RPM input)
MODEL D: 2 to 5 hp; ratio 8 to 1; speed range 360/2880 (with 1725 RPM input)
MODEL C: 1 to 3 hp; ratio 9 to 1; speed range 400/3600 (with 1725 RPM input)
MODEL A: ¼ to ¾ hp; ratio 16 to 1; speed range 215/3450 (with 1725 RPM input)

Now . . . it's easy to get peak production speeds at higher horsepowers, too!

Yes, you can now apply the many advantages of Worthington Allspeed Selectors to your heavier machines. The new D and E models have the same unique time-, space-, and money-saving features that in the past 4 years have made the lighter A and C models nation-wide favorites on applications requiring peak production speeds with precision control.

How to select the right size

To be sure of getting the right selector for the job, call in your nearby Worthington Distributor. He can select the one right unit for you in a matter of minutes. Ask him for a copy of the Worthington Allspeed Selector Bulletin . . . which proves that in variable speed drives, too, *there's more worth in Worthington*. *Worthington Pump and Machinery Corporation, Merchandising Division, Harrison, New Jersey. 36 District Offices throughout the U.S.*

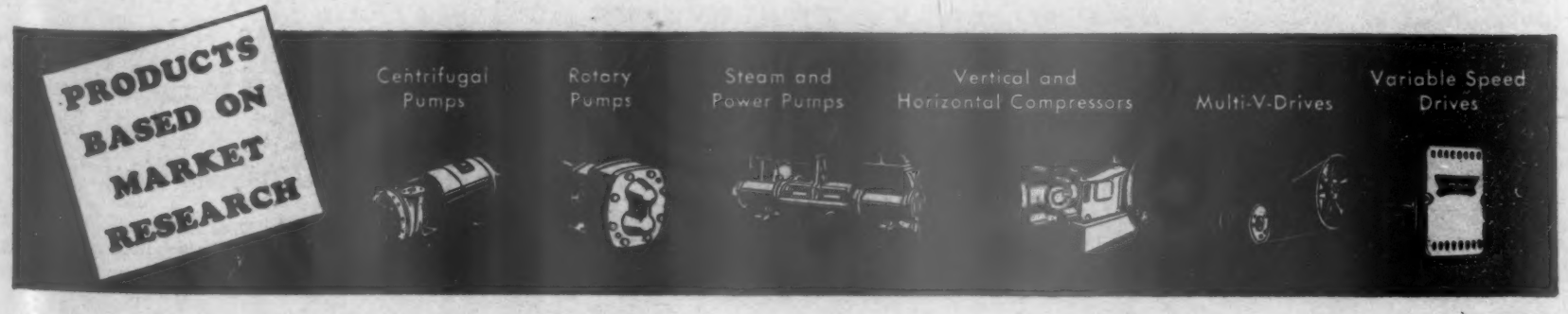


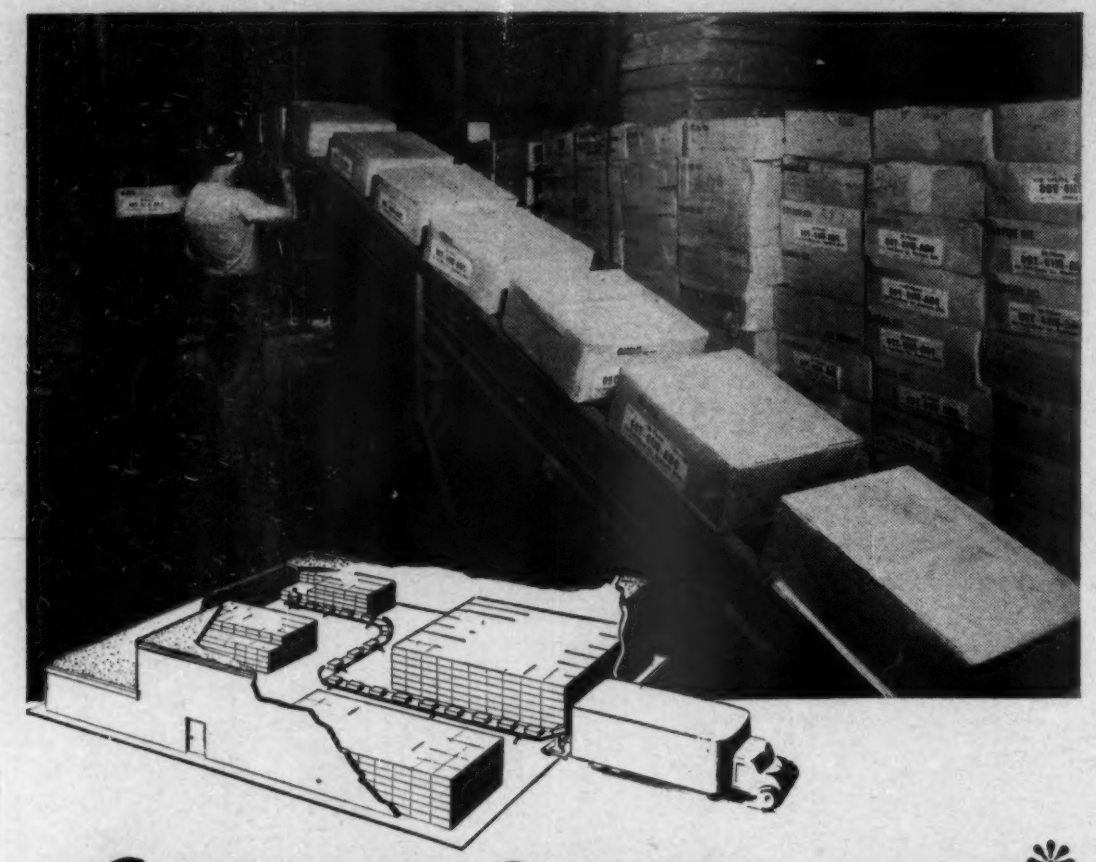
Only Worthington Allspeed Selectors Offer All These Advantages

Belts in tandem permit operational smoothness not possible in single-belt drives . . . exclusive, automatic, positive belt-tensioning . . . high speed ratios in the smallest space . . . belts quickly changed without dismantling unit.

B7-3

WORTHINGTON





2 MEN load 9 TONS per hour*

*IN ONE YEAR THIS EQUALS
43,200,000 Pounds or 2 Heavy Cruisers

THE PROBLEM

Baker Cartage Company of Detroit hauls cartons of pistons for the Ford Motor Company. Cartons weigh approximately 50 pounds each and are stored in a large warehouse that does not have a loading dock. Cartons must be moved as much as 200 feet and then lifted into a truck.

SOLVED BY RAPIDS-STANDARD

Rapids-Standard engineers suggested Rapid-Wheel Gravity Conveyors with Q-Stands for carrying the cartons through the warehouse and a Rapid Power Booster for lifting them into the truck. The installation has been an outstanding success. Two men, one feeding the conveyor and one stacking inside the truck, handle an 800 carton load weighing 21 tons in 2⅓ hours. The complete operation can be handled by the driver and his helper.

The same set-up is used for unloading trucks. The direction of the Power Booster and the slope of the gravity conveyor are simply reversed.

The installation can also be operated with just one man. The conveyor is set up in the usual way and the man feeds the gravity conveyor until it is loaded with cartons for its full length. Then he climbs into the trucks, turns on the Rapid Power Booster and cartons are fed to him until the line is empty.

Rapids-Standard Portable Conveyors have a time and money saving place in the handling of cartons, bags, cases, bales, cans or packages. Write today for full information on how they will save for you.

OFFICES IN PRINCIPAL CITIES

Manufacturers of
STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division — 370 Peoples National Bank Bldg., Grand Rapids 2, Michigan

pumps, motors, controls, and transformers, are pictorially presented in 12-page catalog. Allis-Chalmers Mfg. Co.

52

HOSE—Air hose and hose for paint spray service are described respectively in Catalog Sections 3460 and 4280. The texts contain details on construction, applications, and sizes. B. F. Goodrich Co.

53

HUMIDIFIERS—Eight-page Bulletin No. 158B describes steam-type humidifiers, heavy-duty floor models, and air-operated explosion-proof units. Explains applications, principles of design and operation, how to select equipment. Armstrong Machine Works.

54

HYDRAULIC CONTROL—Type A Hydrocon, producer and controller of hydraulic pressure and flow, is the subject of 8-page text. Details functions, and diagram shows design. "A Story of the Operation of an Accumulator With Its Auxiliary Equipment" is a 4-page folder offered. Brownstein Mfg. Co.

55

INSULATING VARNISHES—Technical and application data on insulating varnishes are set forth in 40-page booklet CDR-13. Includes specifications, electrical properties, film properties, cure and aging, chemical properties, and other details on different types and grades. Chemical Dept., General Electric Co.

56

INTERCOMMUNICATION—A system of electronic intercommunication is set forth in brochure. Master and substations are pictured, and features listed. Dictograph Products, Inc.

57

LIFT TRUCK DRIVE—Model Z unit gas-electric power for motorized lift trucks is introduced in 4-page Bulletin 114. Internal view displays components, and descriptions, data on speed, specifications, and dimensions are given. The Ready-Power Co.

58

LIFTING BAR—named Rol-R-Lift, is the subject of 4-page folder. Illustrations demonstrate use on different jobs. Arnolt Motor Co.

59

MAGNETIC SCREEN TRAP—designed to remove magnetic and non-magnetic materials from oils, gasoline, air, and gas lines, is treated in 4-page Bulletin 101. Explains functions, and contains installation and dimension diagrams. Cooney Valve & Screen Mfg. Co.

60

MAGNETIC SEPARATOR—Four-page folder deals with a magnetic separator, telling about uses, operating principles, and features. Includes specifications and pictures. The Exolon Co.

61

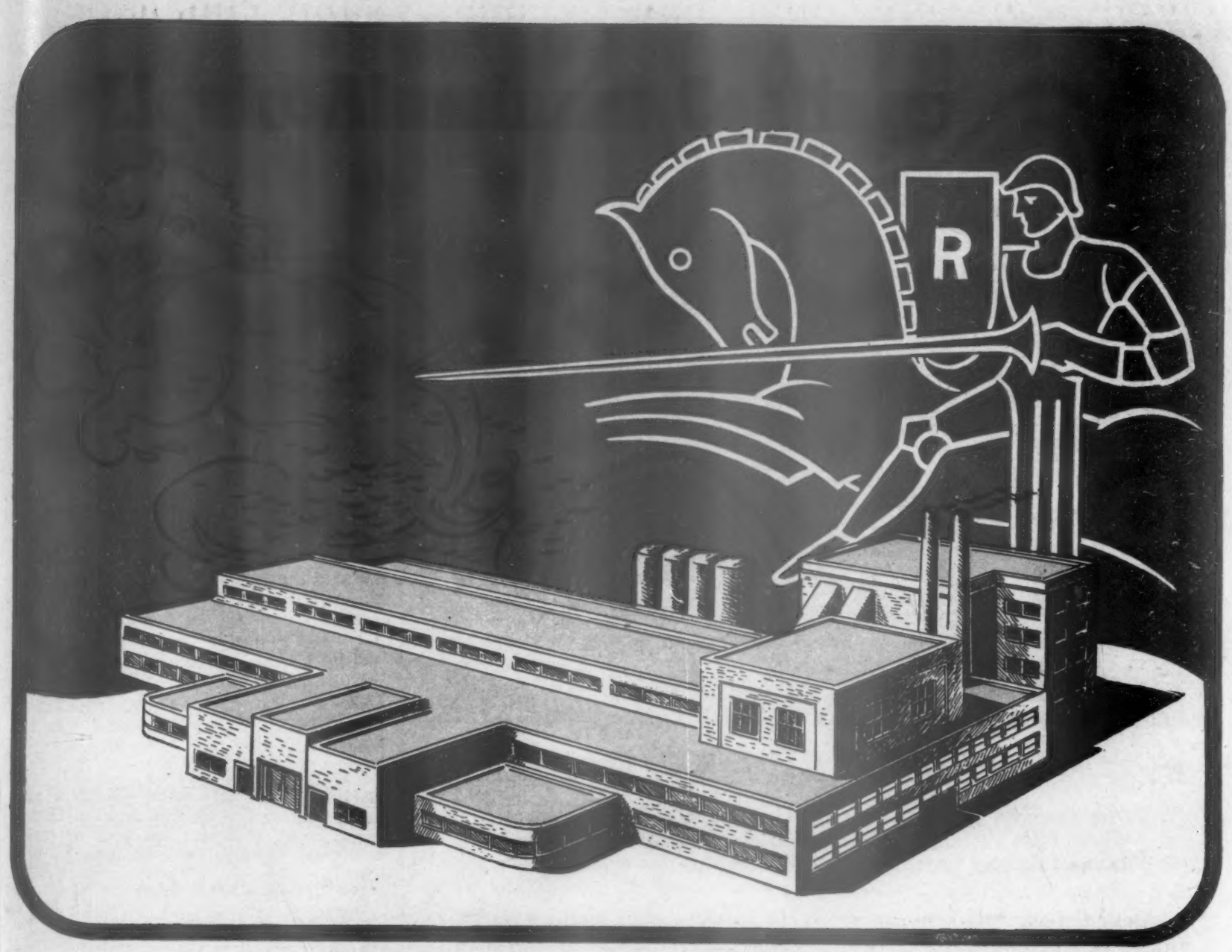
MANDRELS—Illustrated brochure features expanding mandrels for turning, grinding, and milling. Provides specifications and prices. K. O. Lee Co.

62

MASONRY DRILLS—carbide tipped, in standard lengths up to 20 inches, are treated in 6-page pamphlet. Includes prices and specifications. Super Tool Co.

63

METAL WINDOWS—Catalog SA-47 contains details on pivoted and projected windows, steel continuous windows, steel industrial doors, window operators, and other types of windows. Drawings



protect your roof from weather

"Old Man Weather" *never* relaxes! Ward off the damaging effects of sun, rain and snow by weather-proofing your roof with *Liquid Aluminum.*

Coatings made with Reynolds Special Roof Coat Pigments cut down blistering, peeling, dried felts, and alligatoring. These coatings form a metallic parasol of thousands of tiny interlocking flakes of pure aluminum that seals out moisture . . . resists decay . . . reflects up to 75% of the sun's rays . . . stabilizes temperatures *under* the roof.

Owners of public buildings, mills, stores, and warehouses . . . from coast to coast . . . find their roofs last longer, need less attention, because of the added protection of Liquid Aluminum.

For best results insist on aluminum roof coatings of standard quality made from Reynolds Special Roof Coat Pigments, formulated only with a proper type of vehicle. Back of these pigments is a quarter-century of leadership . . . Reynolds scientific "know-how" in the production of pastes and powders for the protection of roofing materials on industrial and public roofs.

Reynolds technicians will gladly work with you on your roof coating problems. See your supplier for details, or write Reynolds Metals Company, 19 East 47th Street, New York, N. Y.

*Trade Mark Reg. U. S. Pat. Off.

REYNOLDS ALUMINUM PIGMENTS

ROOF COATINGS OF LIQUID ALUMINUM

1996-P6-5B

It's Light . . . Portable . . . BUT STRONGER!

The Lamson Portable Lightweight Gravity Conveyor saves time . . . cuts handling costs . . . reduces breakage in loading and unloading freight cars, trailers and trucks.

Designed for fast one-man set-up, it safely carries cleated boxes, fragile cartons and boxes holding glass products. You can extend it to any section of a warehouse . . . or use it to supplement any built-in conveyor system.

Made in 10-foot connecting, straight and curved sections, the Lamson Portable Conveyor is nevertheless rigid, durable and stronger than most other types. Over short or long routes, down inclines and around corners, it is readily adaptable to handling a variety of loads in size, shape and weight. *The full length rollers* handle top-heavy packages and restrain cartons from running off the sides. Easily carries live loads up to 46 pounds per foot with minimum section deflection.

Speed-Up Deliveries . . . Cut Handling Costs! Send This Coupon TODAY !

Does More . . . COSTS LESS

Long recognized as the pioneer in conveyor systems, Lamson is able to produce the Lightweight Portable Gravity Conveyor *at less cost to you.* You get the greatest measure of service and yet save up to 30% on the initial cost.

Lamson Corporation
150 Lamson St., Syracuse 1, N. Y.

Please send me without charge or obligation your folder, "Lamson Lightweight Portable Gravity Conveyor."

Name_____

Company_____

Address_____

show details of structures, and installation data are included. J. S. Thorn Co.

64

MOTOR-DRIVEN EQUIPMENT—and plant facilities for designing and building machinery are pictorially presented in 32-page Bulletin 471. The Bunell Machine & Tool Co.

65

MOTORS—Features of totally enclosed motors, of the fan-cooled and non-ventilated types, for machine tools, are described and illustrated in 8-page Bulletin MU-25A. Wagner Electric Corp.

66

OIL BURNING SYSTEMS—Bulletin 60 contains diagrams graphically illustrating the flow of oil from tank to flame through the oil burning system. Features are detailed. Bulletin 61 tells about fire box design and combustion principles. Ace Eng. Co.

67

OIL FILTERS—for lubricating, fuel, cutting, and hydraulic oils, are explained in 6-page pamphlet. Cutaway view shows structure, and design is discussed. Engine Life Products Corp.

68

PAGING SERVICE—"The Great Time Saver" is the title of 12-page brochure illustrating use of a paging service to locate personnel, or to sound "start" and "stop" work signals automatically, or for emergency calls. The Autocall Co.

69

PAINT BRUSH CLEANER—Electric and hand operated models of Spin-a-Brush paint brush cleaners are demonstrated in illustrated circular. Contains sketched directions for use. Attachments are outlined. Portable Electric Tools, Inc.

70

POWER TOOLS—including portable drills, saws, bench grinders, hydraulic presses, airguns, blowers, and attachments are presented in 33-page Catalog 1. Aristo Power Tools, Inc.

71

PROTECTIVE COATING—called Barriercoat, for moisture-proofing concrete, metal, or wood surfaces, is described in 6-page circular. Carbozite Protective Coatings, Inc.

72

PROTECTIVE COATINGS—for preventing corrosion on masonry, metal, and wood, are treated in 4-page publication. Prufcoat Laboratories, Inc.

73

PUMP—Condo-Vac return line vacuum and boiler feed pump for vacuum heating systems and industrial services is described in 4-page revised Bulletin 270V. Chicago Pump Co.

74

PUMPS—Catalog G-47, 180 pages, covers centrifugal, sump, high-pressure, boiler-feed, "Turbo-Flo," rotary, and other pumps. Sectional and exterior views supplement descriptions of construction and operation. The Deming Co.

75

PUMPS—Four-page Bulletin XXX pictorially presents pumps for different applications. Indicates capacities, heads, operating speeds, and other data. Marine Products Co.

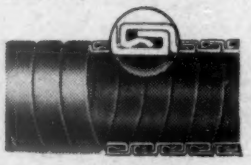
76

REFRACTORY CEMENT—called Air Set, for use with clay or insulating fire brick,

hot job? satisfactory service? ...use REX TUBE!

A Cleaver-Brooks Bituminous Booster is shown in action. REX-TUBE, Type RT-15, always delivers full value in efficiency on "hot" process jobs like this. Photo courtesy of Cleaver-Brooks, Milwaukee, Wis.

Cross-section view of REX-TUBE, Type RT-15.



When you have an unloading problem involving tar, asphalt, bituminous products, vegetable oils, fats or other oils . . . where heating is frequently necessary to facilitate flow . . . REX-TUBE, Type RT-15, does this job efficiently. For this is the rugged, flexible, interlocked metal hose made by C. M. H. especially for the handling of hot process work. Materials at high temperature do not deteriorate REX-TUBE, nor is the substance conveyed contaminated. REX-TUBE, Type RT-15, is built to withstand hard usage. It is made from heavy strip steel or bronze in sizes from 1″ to 12″ I. D. inclusive. Literature is available.

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***the science of FLEXONICS . . .** "The controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion" . . . is exemplified in the basic products of Chicago Metal Hose Corporation.

"FLEXON" *identifies C. M. H. products, which have served industry for more than 44 years.*

CMH CHICAGO METAL HOSE CORPORATION

Maywood, Illinois • Plants: Maywood and Elgin, Illinois

get STAR satisfaction from this complete line

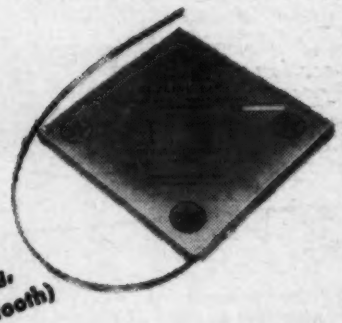
In the complete STAR line, there's a STAR blade for every kind of job and whatever the job, you'll find your hack saw or band saw doing it better with a STAR blade.

Tell your supplier what you want. Let him select your blade or frame from the complete STAR performance-proved line. You'll have a faster, cleaner cutting, longer lasting blade; you'll have the right blade, a STAR BLADE!

HAND BLADES

POWER BLADES

FRAMES



BAND SAWS (Metal cutting, including Skip-tooth)

Ask your supplier for "Metal Cutting" free booklet on care, use and selection of band and hack saw blades and frames.

Sold only through recognized distributors

CLEMSON

CLEMSON BROS., Inc., Middletown, N. Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson D-17 low-a machine

77

RESPIRATORS, GAS MASKS—as well as inhalators, dust masks, oxygen breathing apparatus, work masks for toxic atmospheres, and an abrasive helmet are featured in series of bulletins. Mine Safety Appliances Co.

78

ROOF MAINTENANCE—with plastic and liquid roof resurfacers is the topic of brochure illustrating application. Explains functions and results obtained. Stonhard Co.

79

ROOF SPRINKLERS—providing an automatic roof cooling system, are set forth in 4-page folder No. 37-A-1. Function is explained, and construction detailed. April Showers Co.

80

ROTARY GEAR PUMP—Illustrated booklet is devoted to the Constant-Flo rotary gear pump. Contains information on structure, applications, standard sizes and specifications, as well as dimensional diagrams. John S. Barnes Corp.

81

RUBBER BUCKETS AND DIPPERS—as well as acid rubber gloves, for handling acids, corrosives, liquid explosives, and other active liquids, are introduced in 4-page Catalog Section 9425. Contains descriptions and lists uses. B. F. Goodrich Co.

82

SAW—Gasoline engine and electric motor driven portable power saws are discussed in 4-page Bulletin 132. Photographs indicate how different types of cuts are made, and specifications are listed. Nordberg Mfg. Co.

83

SELENIUM RECTIFIERS—for d.c. power requirements, are set forth in looseleaf catalog. Provides data on applications, features, installation, and ratings. Richardson-Allen Corp.

84

SOLENOID—consisting of base, armature, coil, coil locks, and back stops, is the subject of 4-page text. Practical Electric Co.

85

SPECIFIC GRAVITY TESTERS—Catalog Section 91-B contains dimensional and operational details of a continuous liquid specific gravity indicator, and product gages. Fischer & Porter Co.

86

SPRAY PIPE—Illustrated leaflet features a spray pipe for use as an all-purpose shower, steam spray for humidifying, foam killer, or for other applications. The Emerson Mfg. Co.

87

STEAM GENERATORS—Pictorial brochure displays "packaged" steam generator installations, as well as cutaway view of generator interior. Includes data on design and performance. Cleaver-Brooks Co.

88

STEAM GENERATORS—Oil-fired unit steam generators, ranging in size from 40 to 500 horsepower, are treated in 8-page Bulletin 1000-E. Construction and operation are detailed, and data on performance and dimensions are furnished. Preferred Utilities Mfg. Corp.

89

STEAM HEATING SYSTEMS—are treated in 16-page Catalog 76. Contains data on radiator valves, thermostatic traps, con-

LITTLEFORD FORMS STEEL for All Your Needs

We make bins, machine pans, stacks, breechings, tanks. Also chutes, guards, vats, machine bases, special metal parts. In 65 years we've really learned how to serve industry. Let us help *you!*

LITTLEFORD

Littleford Bros., Inc.
467 E. Pearl St.
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IT COSTS *NOTHING*... TO MOVE IT WITH SPEEDWAYS

SPEEDWAYS SAVE YOU LABOR... TIME... MONEY!

On loading platforms . . . on production lines . . . in warehouses . . . SPEEDWAYS is the shortest, fastest and cheapest distance between any two points in your plant.

Model 15-SW-10, 15" wide overall, ten 2" roller wheels per ft.—illustrated with 45° Flipswitch—moves practically all standard sizes of cases, cartons and boxes.

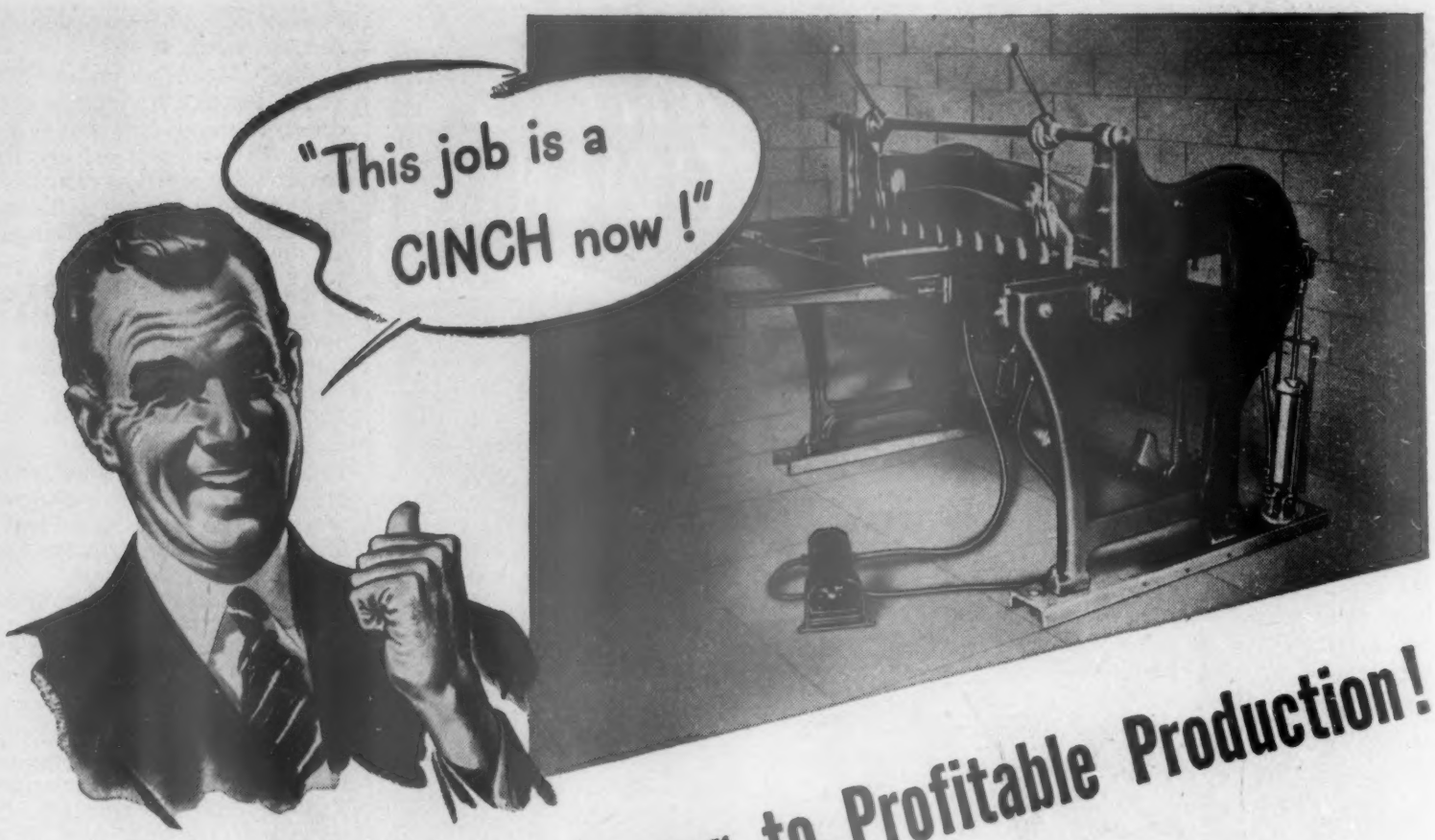
Available in 5' & 10' straight sections, 45° and 90° curves. Lightweight. Portable sections interlock—no tools necessary for installation.

Write for Speedways FREE new folder No. 147

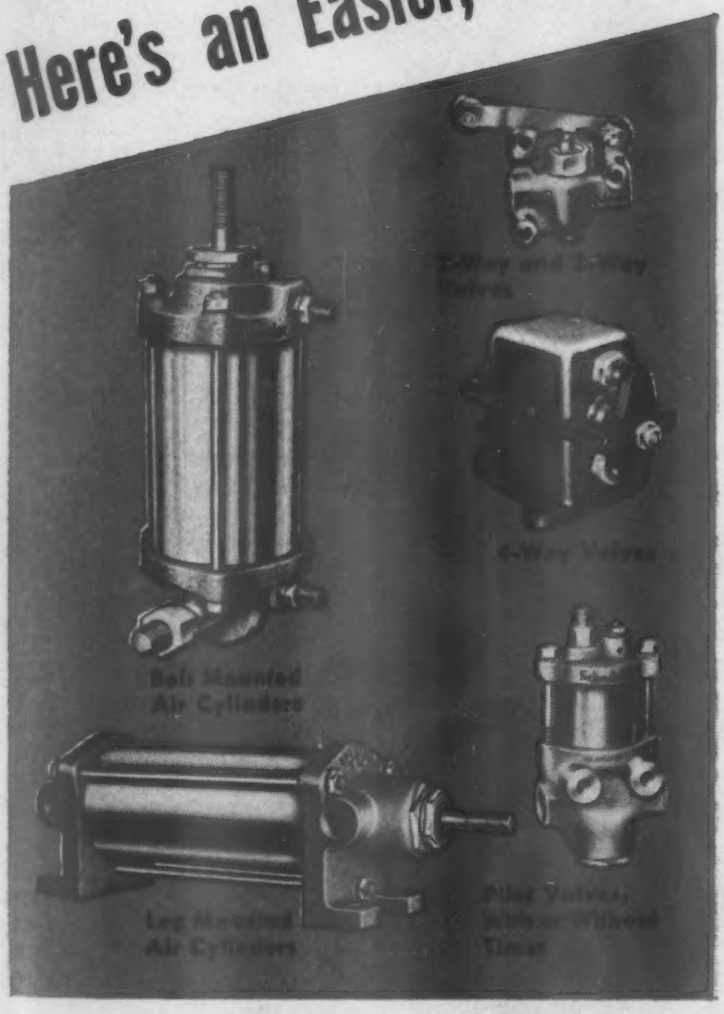
KEEP 'EM ROLLING WITH SPEEDWAYS CONVEYORS, INC.

1241 Niagara St. Buffalo 13, N. Y.

Represented by experienced Material Handling Equipment Engineers in Principal Cities.



Here's an Easier, Quicker Answer to Profitable Production!



Can you improve production and safety of manufacturing operations quickly and easily without expensive alterations to plant or machinery?

Yes! By using compressed air, efficiently controlled by Schrader Valves and Air Cylinders, to operate your machines. Take this shearing machine for instance: by converting to air control, production is boosted, operator fatigue eliminated, and there is far greater ease and versatility of operation. Not only that but with air power you can frequently shear heavier gauge metal. This is a typical illustration of what Schrader Valves and Cylinders can do when put to work on shearing machines, power presses, welding machines, kick presses, arbor presses and many other essential machines.

Consider Schrader Valves and Cylinders as production boosters in your plant. Installation can often be made with little or no extra load in your present compressor capacity.

Schrader Air Cylinders and Valves give you efficient control of compressed air. Help you accomplish more—in less time—with less manpower used.

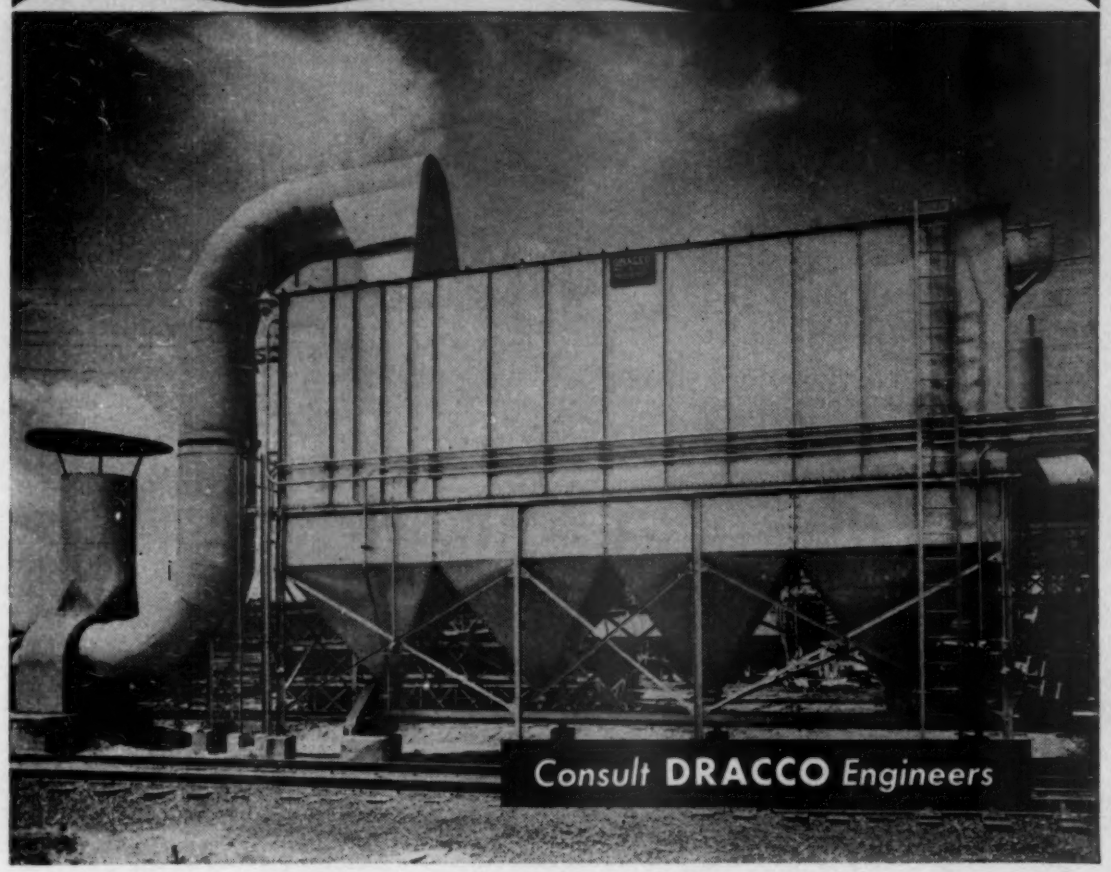
For further information on how these Schrader products can help you, write today to Department 6.

EVERYTHING FOR EFFICIENT AIR CONTROL

Air Cylinders, Operating Valves 2, 3 and 4-way (hand, foot and remote control), Press Operating Controls, Pneumatic Machine Controls (all types), Air Ejection (Knockout) Sets, Quick Acting Couplers, Blow Guns, Air Hose and Fittings, Hydraulic Gauges.

Schrader
PRODUCTS
CONTROL THE AIR

A DUST-FREE PLANT IS ALWAYS MORE EFFICIENT



When other factors are the same a plant that is DUST-FREE is more efficient and will produce at lower cost. This is important in a highly competitive economy. DRACCO Dust Control protects equipment — prolongs its useful life and reduces maintenance to a minimum. A healthy climate increases the workers' efficiency ana results in higher production. DRACCO Engineers have more than 30 years experience solving dust problems — why not consult them?

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4091 E. 116th St., Cleveland 5, Ohio *New York Office: 130 W. 42nd St.*

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

densators, and proportionator systems. Barnes & Jones, Inc.

90

STEEL INSULATION—for refrigerated construction is the subject of 12-page text. Types and uses are indicated for various temperature ranges. Floor, wall, and ceiling structure is diagrammatically illustrated. American Flange & Mfg. Co.

91

STORAGE TANK PREHEATER—Method of heating oil or other heavy bodied substances in the bulk storage tank before they enter the suction line is described in bulletin. Tells how preheater, called Hot Spot, functions. Rempe Co.

92

TEMPERATURE RECORDERS—General-purpose Tempscribe recorders of air temperature and electrical operation, and Fyrite CO_2 indicator for analyzing flue gases, are cataloged in 4-page Bulletin 715. Sketches show construction features, and ranges are listed. Bacharach Industrial Instrument Co.

93

THERMOSTATS—called Thermoswitch, for temperature regulation and control, are treated in catalog. Contains information and cutaway pictures on construction, details on operation, temperature variation, characteristics of heat sources, and other data. Fenwal, Inc.

94

TRACTOR-EXCAVATOR—known as Model T6 Traxcavator, is described in illustrated Form 977. Tells about uses, construction, operating features, and lists specifications. Trackson Co.

95

VACUUM MEASUREMENT—with a gage called the Skanascope, which provides continuous color indications, is treated in 4-page text. Describes design, operating principles, and gives instructions for use. Distillation Products, Inc.

96

VALVES—A 20-page Valve Cross Reference Chart contains a complete listing of manufacturer's valve numbers in order, with descriptions. Includes steel, iron, and bronze types. The Ohio Injector Co.

97

VALVES—Small volume pressure reducing and regulating valves for special installations are announced in 4-page Bulletin No. 199. Tells about uses, and drawing reveals design. Bulletins on other types of valves are listed. A. W. Cash Valve Mfg. Corp.

98

VARIABLE SPEED DRIVE—named Variable-V-Planetary infinite ratio Speed Selector, is treated in illustrated 4-page brochure. Outlines engineering principles of operation, dimensions, ratings, and applications. The B. F. Goodrich Co.

99

VENT SETS—Data on ratings, dimensions, construction, and operation of vent sets are provided in 12-page Bulletin 3499. Pictures display models for different applications. Buffalo Forge Co.

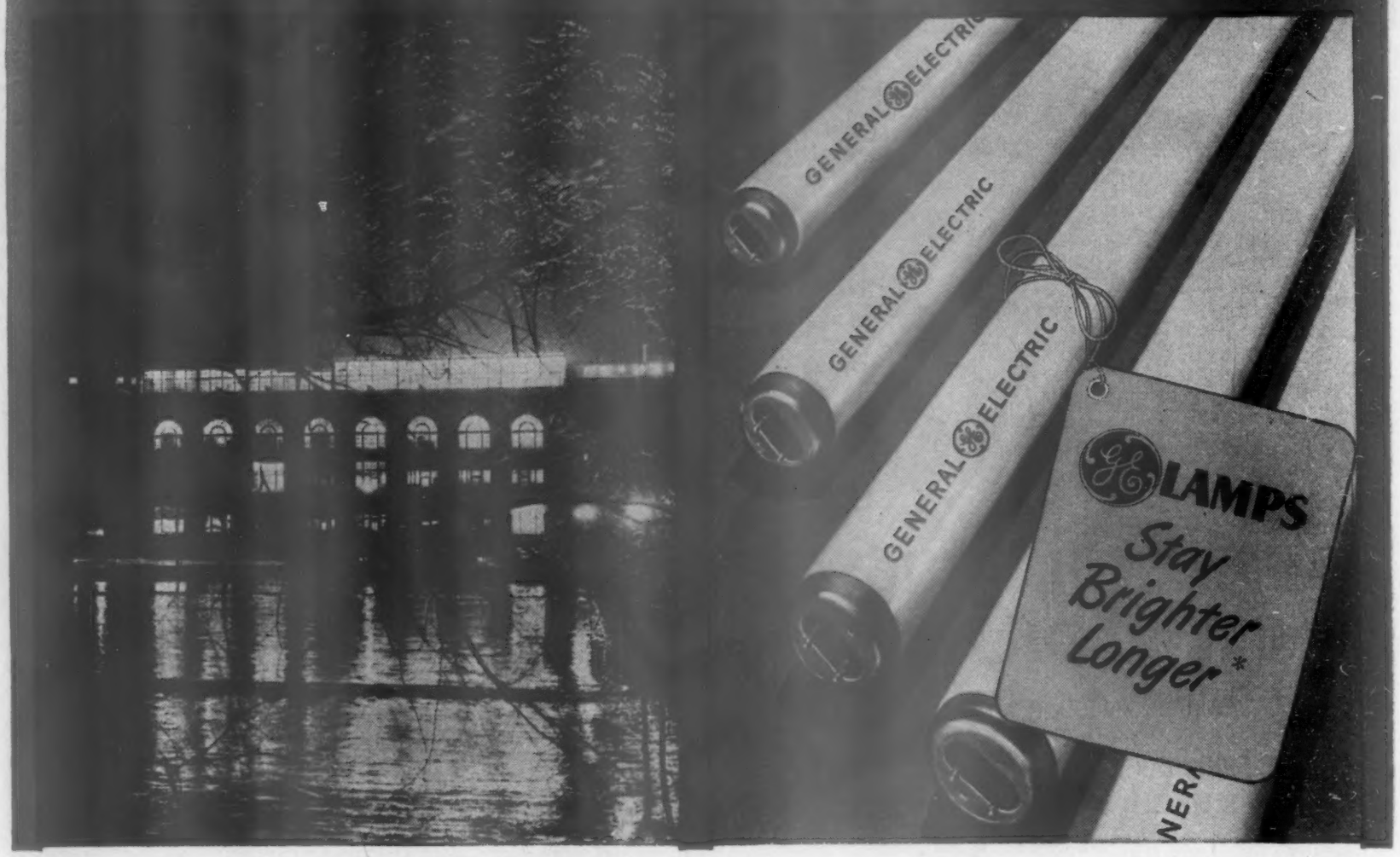
100

VENTILATING SETS—Self-contained belt-driven ventilating units, and a motor-driven, direct-connected blower are described and illustrated in 8-page Bulletin 109. Dimension chart and specifications are included. The Bishop & Babcock Mfg. Co.

101

VENTILATION—Uni-Flo grilles and registers, Venturi-Flo ceiling outlets, air

Two ways to be sure of quality in Fluorescent Lamps



1 **ONE WAY** would be to build yourself a set of test racks where you could burn sample fluorescent lamps day and night for month after month. By keeping accurate records, you'd then know how long they lasted and how much light they gave you for your money. That's what General Electric does in the Testing Section of its Standardizing Division, shown above, where lamps from every G-E fluorescent lamp factory are carefully and continuously checked. The amount of current used is enough to light a medium-sized city. Actually, these test racks represent just one of more than 480 tests and inspections that guard G-E lamp quality. You'd hardly find it profitable to go to all this trouble on your own. But there's a much simpler way . . .

2 **INSIST ON THE GE MONOGRAM**

on all the fluorescent lamps you buy for your home and business. It pays to ask for lamps marked G-E. *General Electric Lamp research is constantly at work with one idea in mind —to make G-E lamps *Stay Brighter Longer.*

FREE! *Write General Electric, Div. 166-P5, Nela Park, Cleveland 12, Ohio, for your free copy of new booklet of facts and figures about fluorescent lamps.*

G-E LAMPS

GENERAL ELECTRIC

HANSEN COUPLINGS GET RESULTS

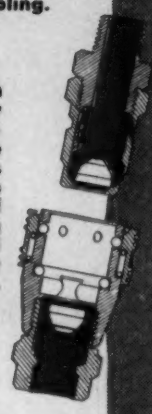
When you use Hansen couplings, connections and change-overs become a matter of seconds —with no hold-up of costly operations.

To connect a Hansen coupling on air, oil or grease lines, you merely push plug into socket —flow is immediate and completely automatic. To disconnect, slide sleeve back with thumb, plug pops out, and supply line is effectively sealed with no leaks or losses.

It's the minutes saved on operations repeated over and over that add up to substantial savings. There's a Hansen coupling for every purpose or pressure requirement — for air, oil, or grease — for oxygen — for acetylene — also the new Hansen two-way shut-off coupling which completely seals both ends of line when disconnected.

Write for industrial catalog!

The Hansen Two-Way, Shut-Off Coupling.



Red section shows how rubber washer in valve stem contacts valve seat in both plug and socket, sealing both plug and socket against leakage instantly.

Red section shows flow of liquid or gas around spool section of valve, permitting free flow of liquid or gas through coupling instantly upon connection.

REPRESENTATIVES

New England States: A. D. GEIGER, Belmont, Mass.
Eastern, Southern States: B-R ENGRG. CO., Baltimore, Md.
Northern Ohio: F. & W. URSEM CO., Cleveland, O.
Southern Ohio, West Va., Ky.: STEINHAGEN AIRLINE PRODUCTS, Dayton, O.
Northern Ill., Eastern Iowa: NORRIS ENGRG. CO., Chicago, Ill.
Indiana, Wisconsin: NEFF ENGRG. CO., Ft. Wayne, Ind.
Central Western States: JOHN HENRY FOSTER CO., St. Louis, Mo., Minneapolis, Minn.
Western, Southwestern States: BURKLYN CO., Los Angeles, Calif.
Northern Calif., Nevada: H. E. LINNEY CO., Oakland, Calif.
Michigan: WM. H. NASH CO., Detroit, Mich.

THE HANSEN MANUFACTURING CO.

1786 EAST 27th STREET • CLEVELAND 14, OHIO

turning vanes, and volume controls, as well as automatic electric controls for heating, ventilating, and air conditioning, are outlined in 12-page booklet No. F.2972. Also mentions small motors. Barber-Colman Co.

102

VENTILATION—Four-page folder tells about a method of "night-cooling" buildings by installing self-cooled motor propeller fans in windows, walls, or skylights. Photographs show how they are used. Ilg Electric Ventilating Co.

103

VISE—powered by air, and foot operated, is presented in 8-page Booklet 47. Sectional view reveals construction. Dimensions furnished. Van Products Co.

104

WALL CLOSET FITTINGS—including horizontal and vertical types, soil pipe, and IPS connections, are set forth in Catalog Supplement 46-3. Contains layout instructions, specifications, dimensions, drawings, and photographs. J. A. Zurn Mfg. Co.

105

WASHROOM EQUIPMENT—including toilet compartments, shower stalls, shower cabinets, and wainscoting, is covered in 20-page Catalog 85. Describes material used, and includes specifications, construction details, and a color chart. The Sanymetal Products Co., Inc.

106

WATER CONDITIONERS—Revised Publication 4021 describes carbonaceous zeolite water conditioning equipment for softening boiler feed and industrial process waters. Typical installations are illustrated, and flow diagrams, curves, tables, and other data supplied. Cochrane Corp.

107

WATER COOLER—Illustrated Form T-222 deals with Model PB-10 self-contained water cooler. Describes construction, specifications, and ratings. Temprite Products Corp.

108

WATER HAMMER—Sealed air chamber designed to eliminate water hammer is featured in Bulletin 120. Selector tables and pressure flow charts are provided. Wade Mfg. Co.

109

WATERPROOF COATING—named Agraseal, for exterior or interior coating of cinder blocks, lightweight aggregate, and concrete blocks, is outlined in 4-page pamphlet. Tamms Silica Co.

110

WELD TIMERS—Models 315 and 316 electronic weld timers are covered in broadside. Lists operating voltage, rating, speed, sizes, and prices. Michel Mfg. Co.

111

WIRING RACEWAY—Three installations of a low potential raceway, called Lopo-Trim, are illustrated and described in 4-page Booklet 543. National Electric Products Corp.

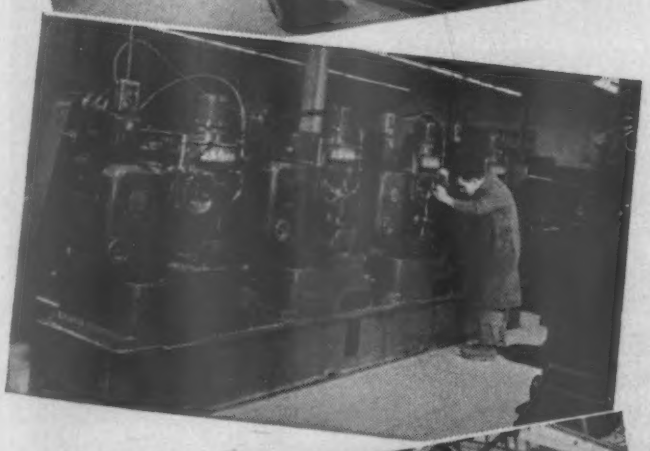
112

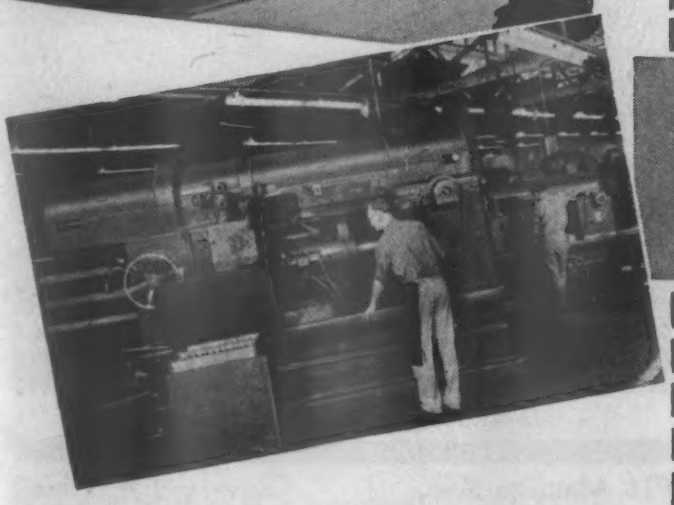
WOOD PRESERVATIVE—and soil poison, named Penta Preservative, for protection against wood-destroying insects, is the subject of Bulletin 46-T. Tells how the pests operate, and function of the chemical. Chapman Chemical Co.

113

WORK GLOVES—arm protectors, finger guards, hand pads, and leggings are presented in leaflet. Includes pictures of the different models. Industrial Gloves Co.

BETTER *GEARS* FASTER
by Ultra Modern Techniques...





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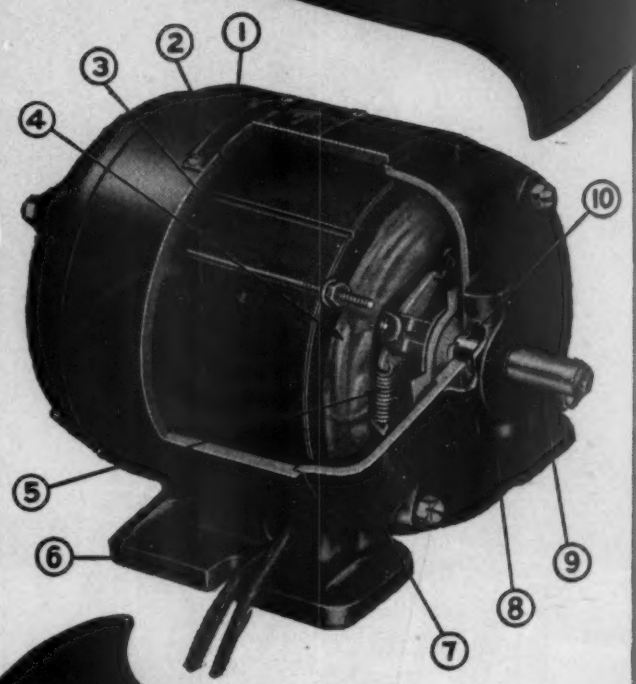

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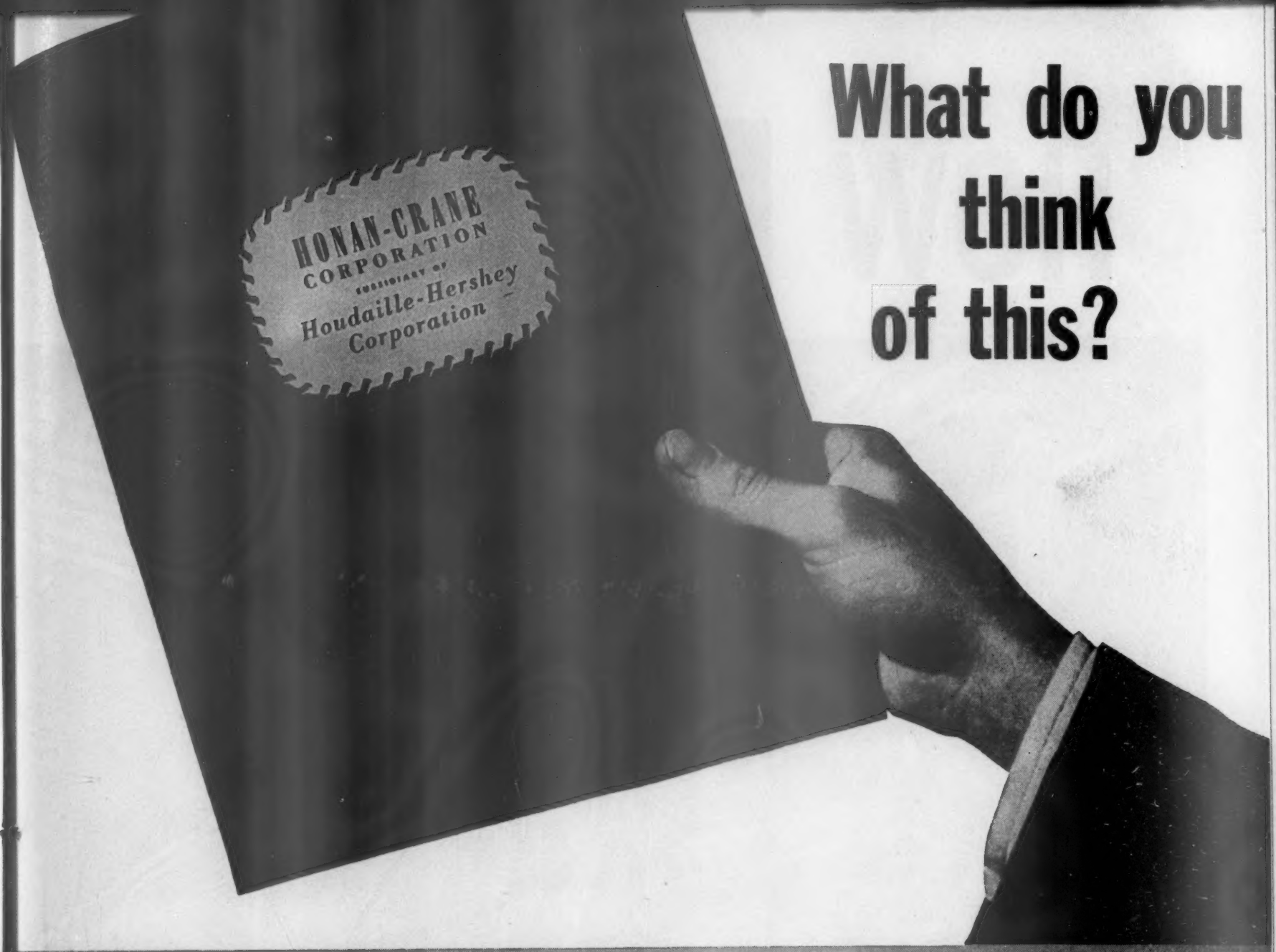

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This is an engineering survey of your plant which Honan-Crane Corporation would like to conduct with respect to the advantages in dollars and cents you might reasonably expect by the installation of oil purification equipment. . . . It includes a complete analysis of your specific problem, the cost of Honan-Crane Oil Purification equipment to meet the problem, and a careful estimate of its effect on your operating costs. . . . You may accept none of it, all of it or any part of it as you choose. . . . The survey doesn't cost you anything. . . . It doesn't obligate you to anything. . . . It merely gives you specific information instead of generalizations about your specific problems. . . . Honan-Crane could provide you with many case histories of oil purification problems and solutions similar to your own—but this is better. This concerns only YOUR plant—YOUR operating costs—YOUR production efficiency. . . . And a pleasing adjustment of the ratio of YOUR overhead to YOUR profit. (Incidentally, if you are a plant superintendent or a works manager, this survey will prove to the boss you're not missing any bets.) Let us send an engineer to explain the survey and its benefits. Just fill out and mail the coupon.

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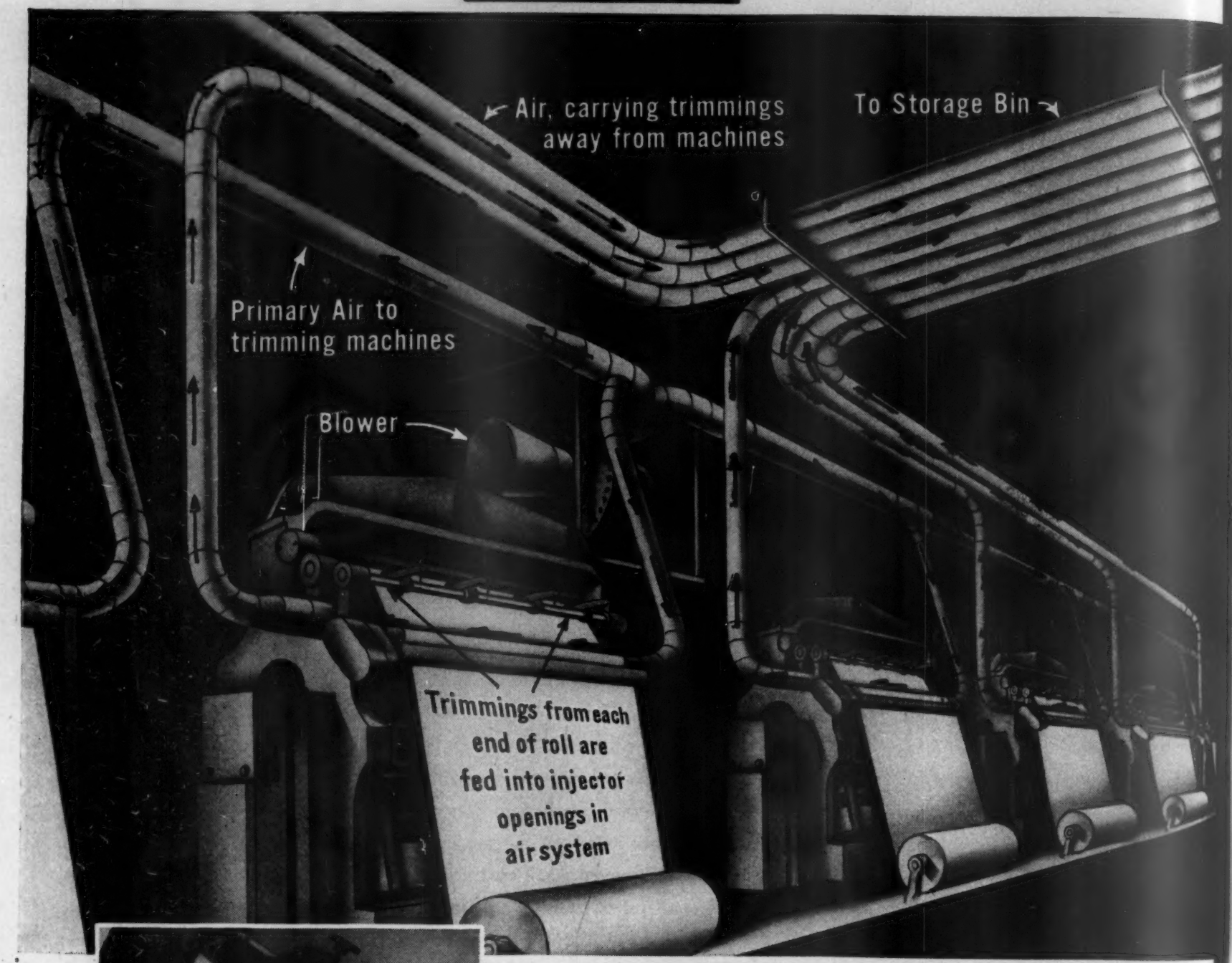
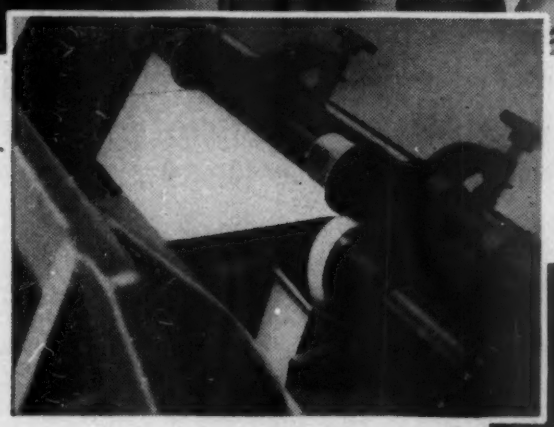
HOW AIR SAVES

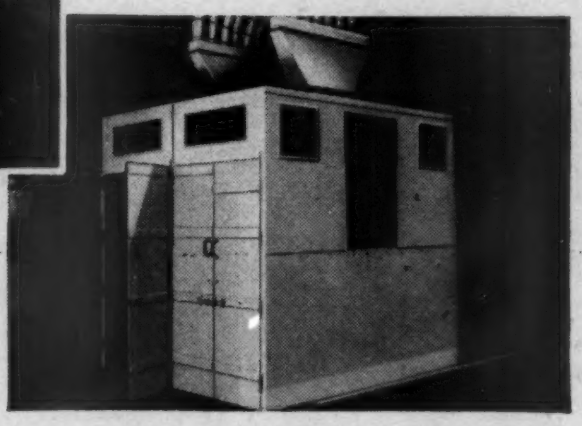

Air, carrying trimmings away from machines
To Storage Bin
Primary Air to trimming machines
Blower
Trimmings from each end of roll are fed into injector openings in air system



Schematic diagram of Sturtevant pneumatic conveying system, installed on a bank of 14 machines for trimming paper towels. Similar systems have been engineered for a wide variety of high-speed trimming operations—from cloth fabrics to aluminum foil.

IT GOES IN HERE

Paper trimmings enter high-velocity air stream, through injector openings at each side of roll.



AND COMES OUT HERE,

in an enclosed storage bin—clean, free from grease and dirt, ready for reprocessing.

ON SALVAGE COSTS

Sturtevant conveyor system collects scrap paper...at 795 miles an hour!

WHEN paper towels are cut to size, at 2500 feet per minute for each machine, the trimmings pile up fast—795 miles of them in a single hour! Collecting this scrap by hand, moving it to storage bins for reprocessing, used to take plenty of costly man-hours.

Was there a *better, less costly* way? There was! This Sturtevant pneumatic conveying system collects the trimmings as they come off the roll—whisks them away on a blast of air, and carries them through overhead ducts to a distant storage room. Result: time saved—money saved—a cleaner, safer place in which to work.

HAVE YOU A JOB THAT CAN BE DONE BETTER BY AIR?

Whatever your business, chances are that skillfully engineered air can help you step up production, cut costs. Here are just two typical examples:

A manufacturer of felt hats found that a Sturtevant pelt-dryer cut drying time from 24 hours to 15 minutes!

In a large textile mill, the installation of a Precipitron,* the electronic air cleaner, eliminated shutdowns formerly required for loom cleaning—saved 8,280 hours a month!

If you think that your costs are too high, Sturtevant engineers will be glad to analyze your problem, show you how you can put air to work to do a better job, faster, and at less cost. For Sturtevant, now a division of Westinghouse, is the only manufacturer of *all* components for every application of engineered air—from conveying, drying, controlling the atmosphere, removing dust and fumes, to ventilation and mechanical draft. Whatever the job, you can look to Sturtevant for ideas, planning and complete equipment. Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

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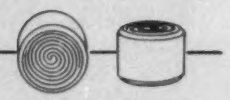

C/R Hammers have malleable iron heads with replaceable coiled rawhide faces.

RAWHIDE is tops for "soft" mallets and hammers. And you can't beat *Chicago* Rawhide. Tightly coiled, specially treated C/R surfaces won't split, crumble or mushroom. They absorb shock, deliver powerful blows, protect delicate surfaces, and stand up under tough use. Always ask for *Chicago* Rawhide.

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- Special alloy steel—corrosion and abrasion resistant.
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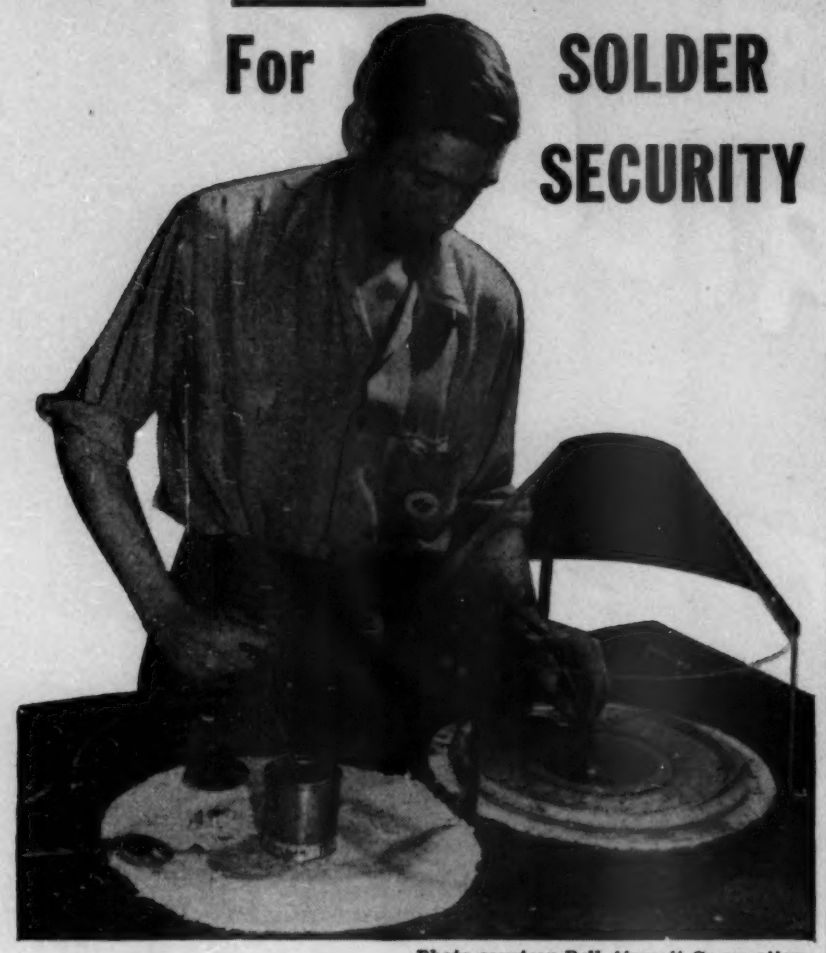

Photo courtesy Bell Aircraft Corporation

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- Nearly half a century of practical experience is behind the development of Kester Fluxes. Drawing on that experience, Kester engineers have developed a vast range of flux formulas covering every possible soldering requirement.
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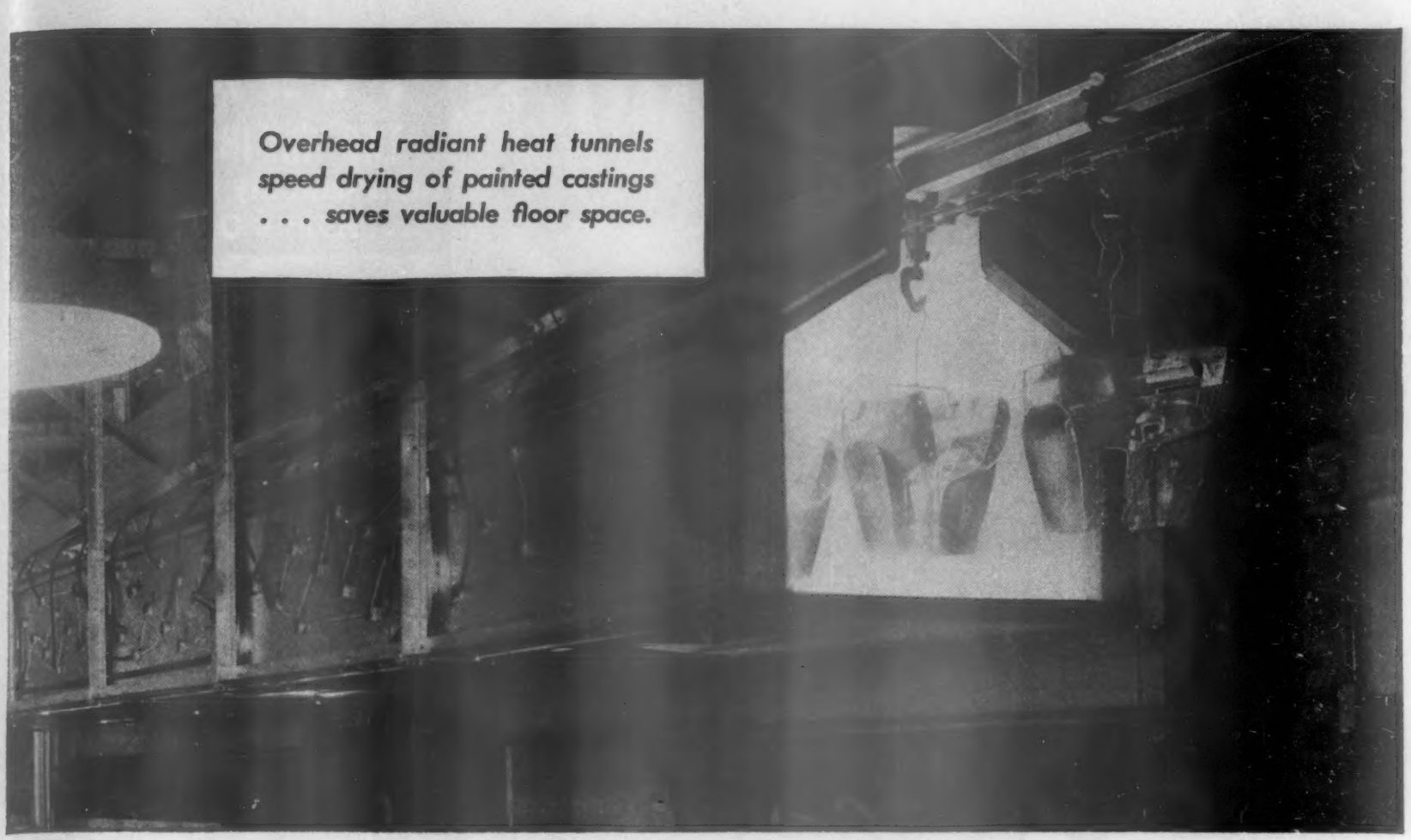

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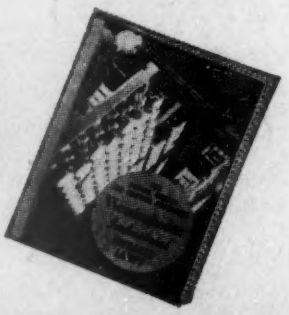
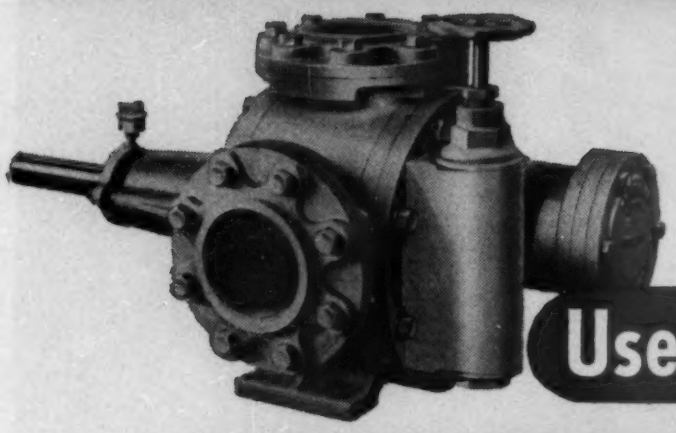
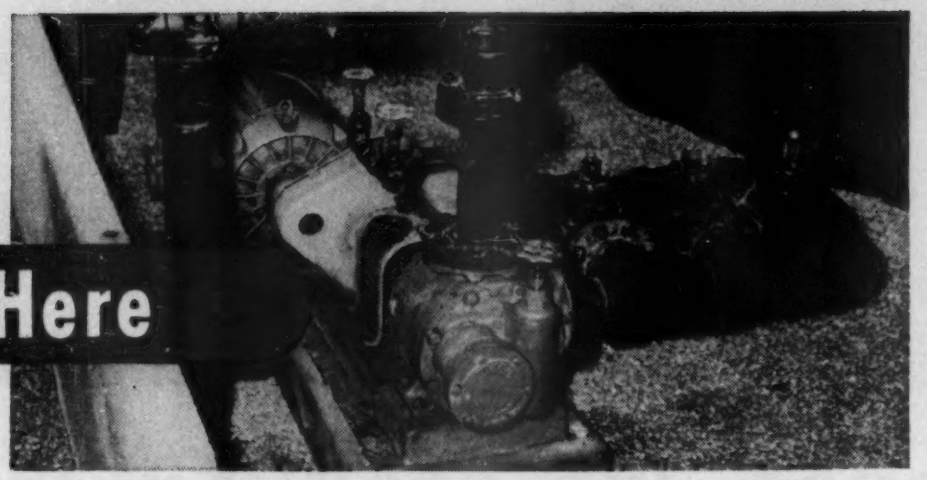
SEND FOR THIS BOOKLET: To explore the opportunities Infrared Heating offers, write for "Industrial Infrared Lamps" —Form A-3817. This complete guide to modern Infrared heat processing outlines the advantages of radiant heat, lists lamps used, shows typical installations and provides detailed information for specific processes. Address Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J.



This Company



Uses This Pump



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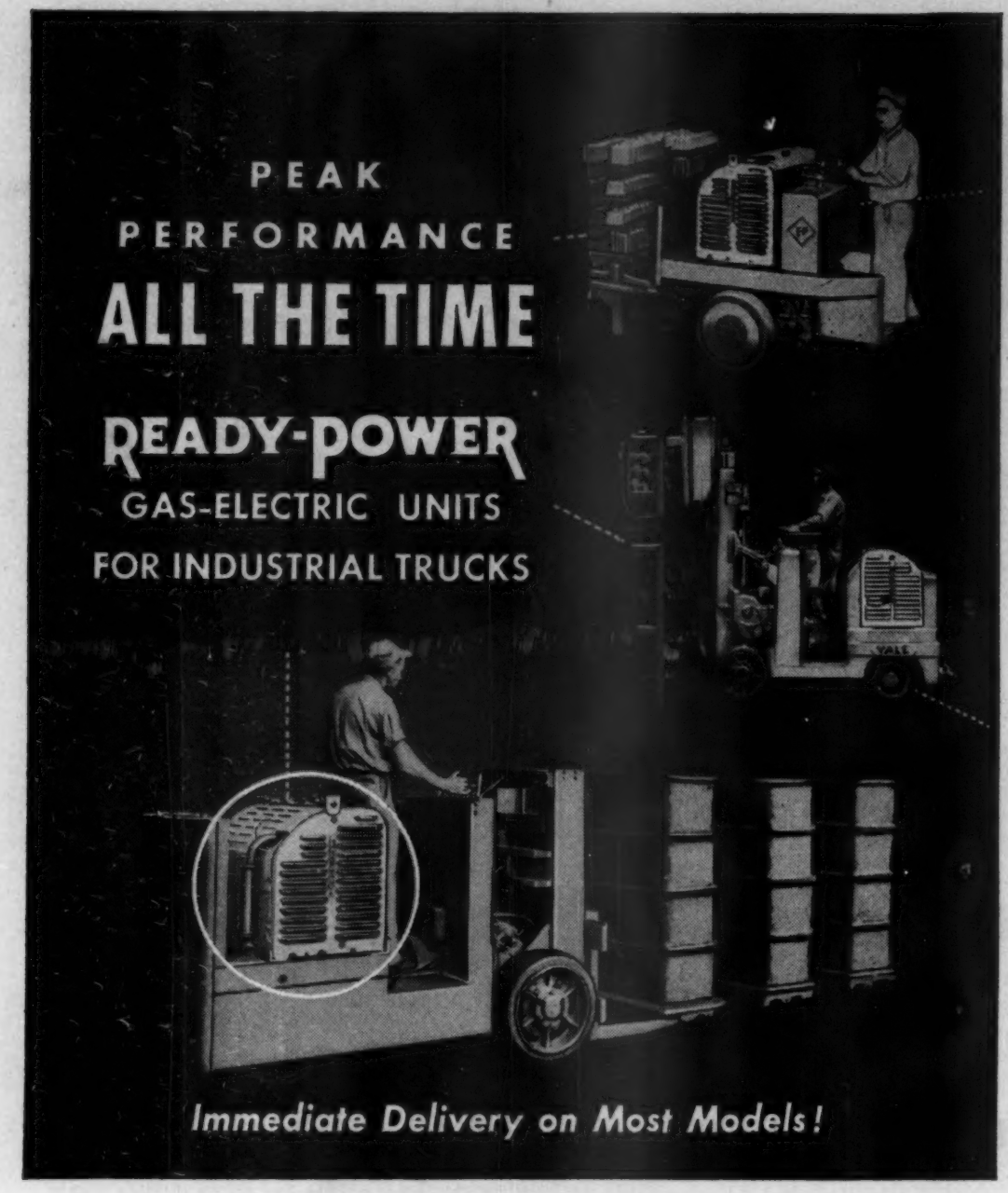

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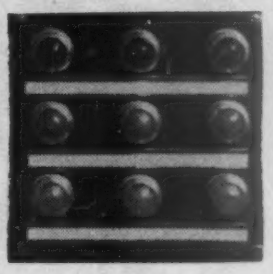

A typical assembly made with Type 590 units, one of many Kirkland types available.

Kirkland indicating lights are ideal for use in building Lamp Annunciators.

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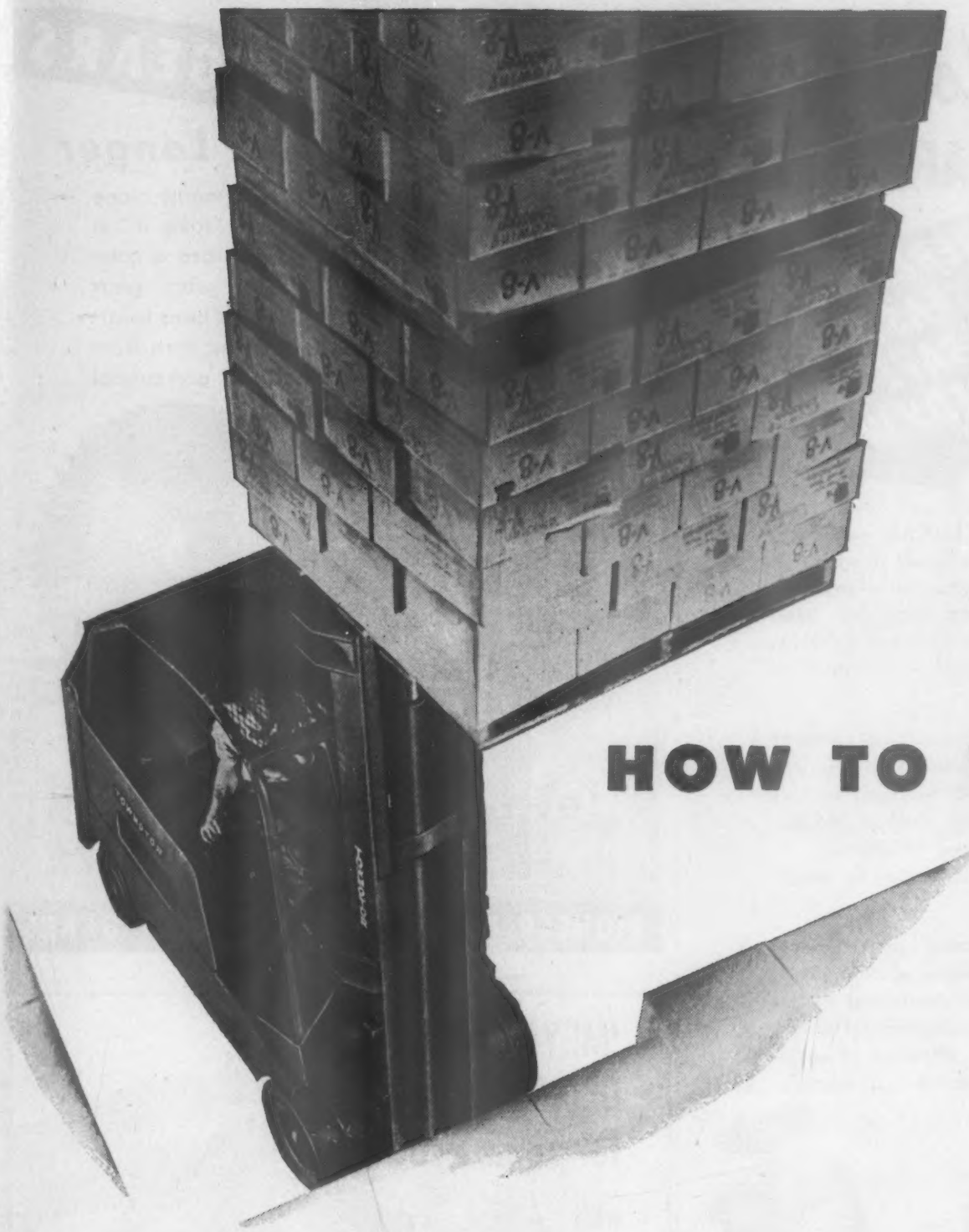

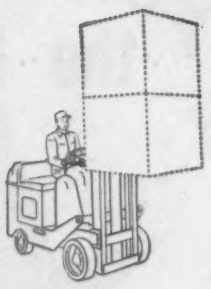

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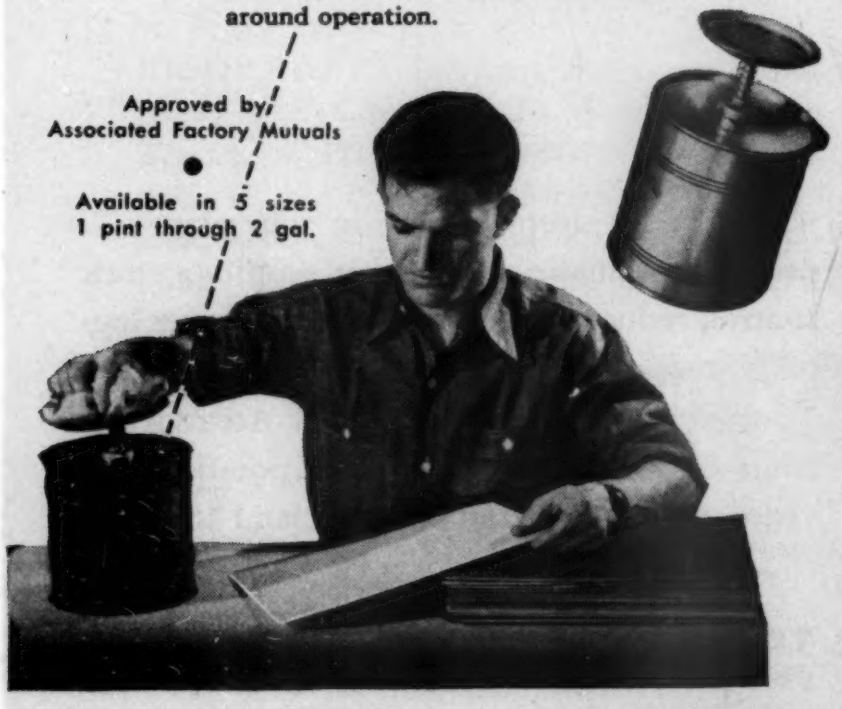

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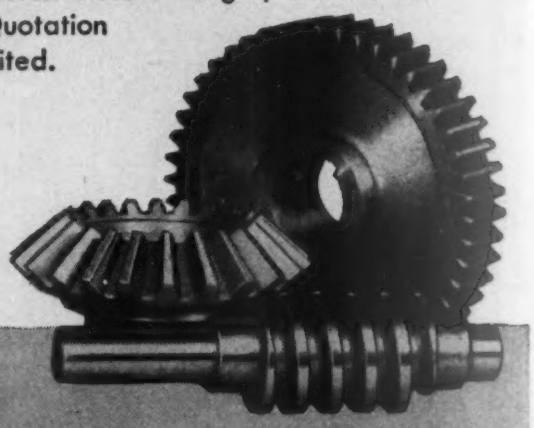

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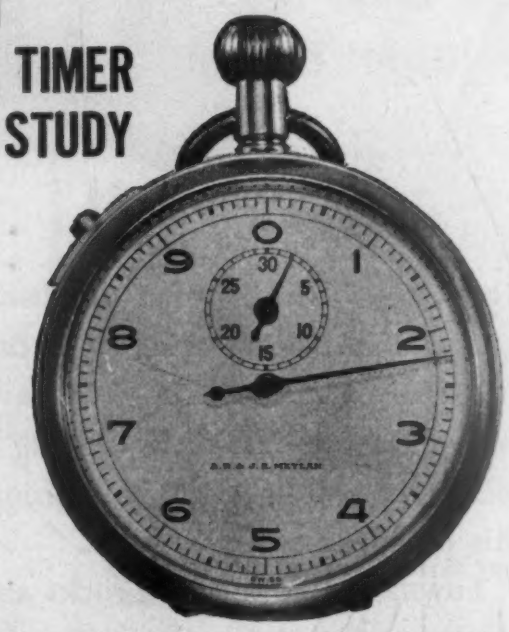

Dial is divided into 100 divisions and one revolution of the long hand is effected in 60 seconds. Small hand registers up to 30 revolutions of the long hand or 30 minutes. Movement has seven jewels and is fitted in a nickel, chromium-plated case. Non-magnetic. Unbreakable crystal.

Operation—Start by moving side slide toward the crown. When an interruption occurs, move side slide down. To continue from point where stopped, advance side slide toward crown. To return the hands to zero, move side slide down and depress crown. Can also be operated "snap back" from crown for time study.

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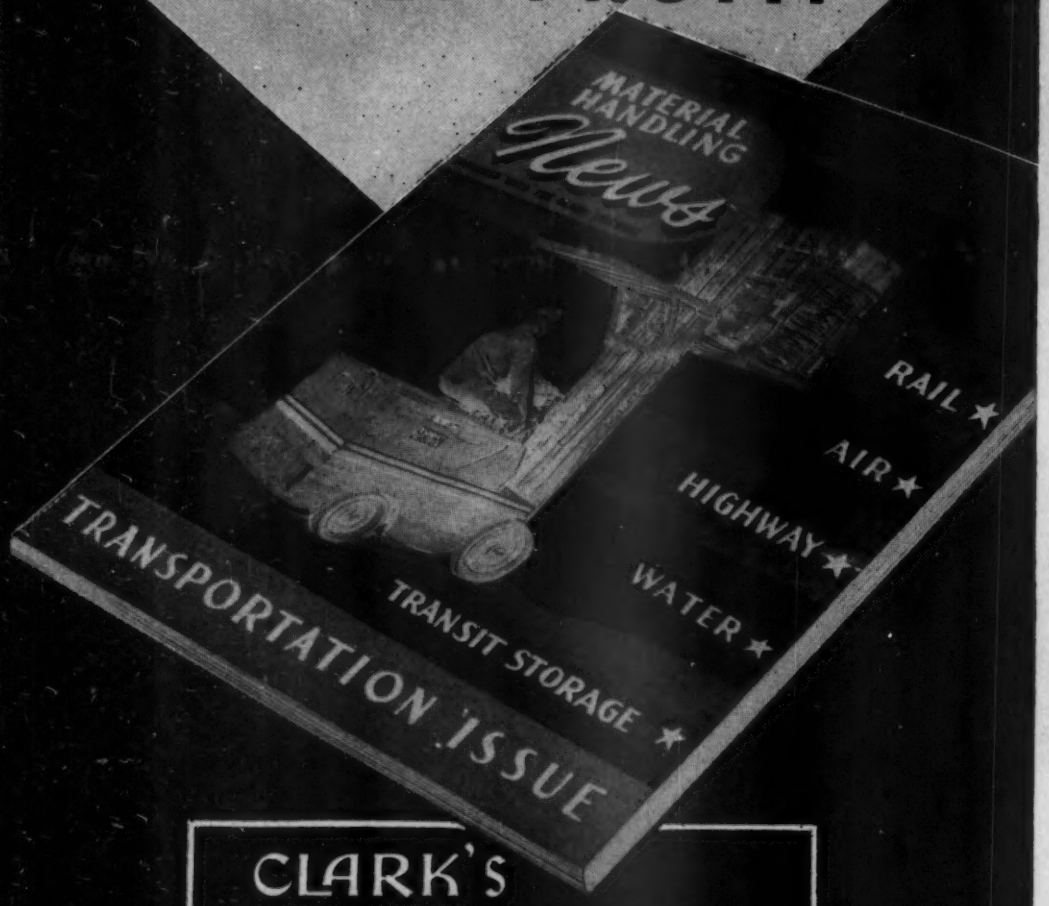

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1. **How long your original building lasts—**
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That is why in choosing your building "cover" you should choose one that insures *permanency* — that you can apply and forget — not one that requires periodical expense of painting, maintenance and replacements.

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2. PLASTICS—For air-tight protection against rust and corrosion.

3. MICA—Finish coat for "weather" protection and pleasing appearance.

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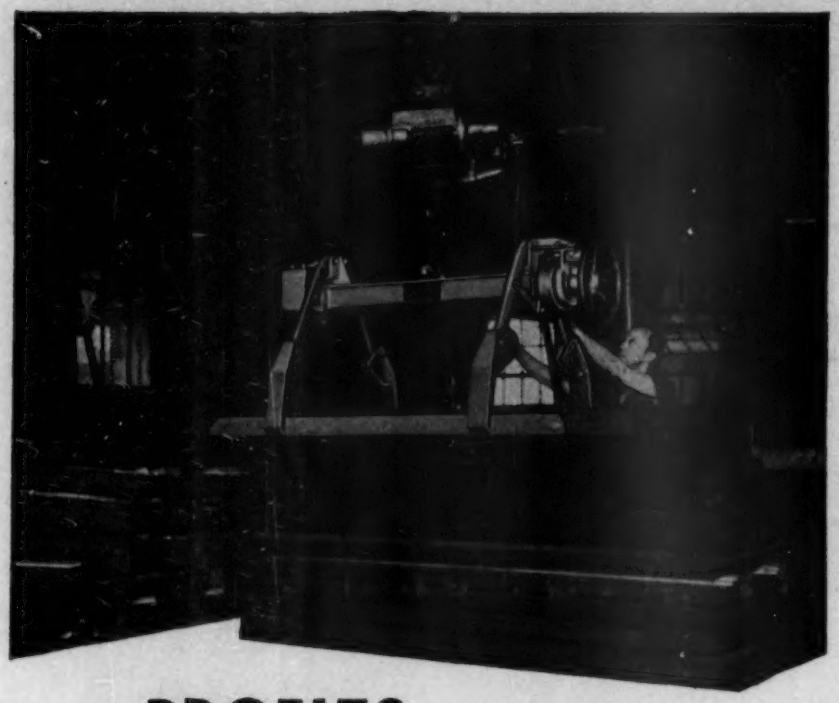

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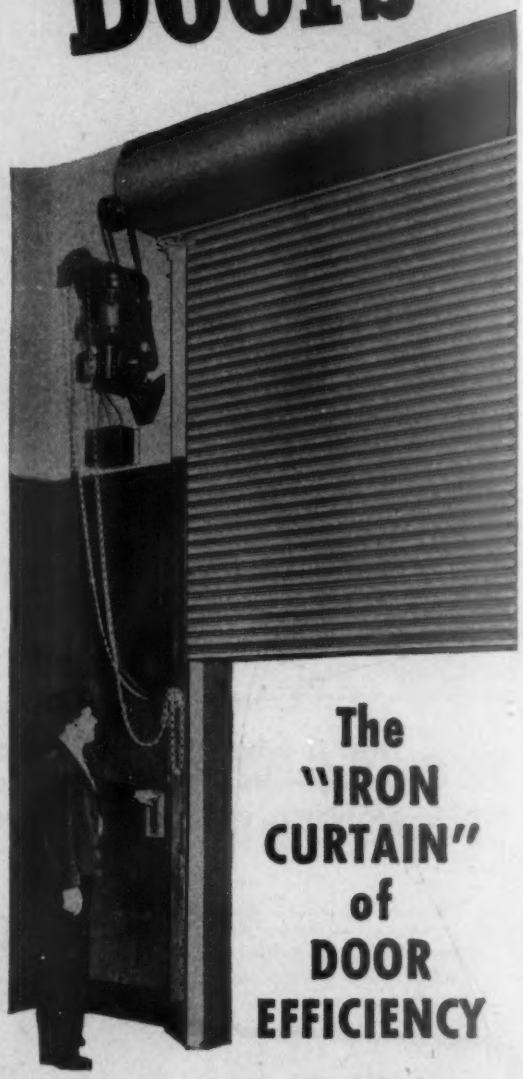
Kinnear Rolling Doors



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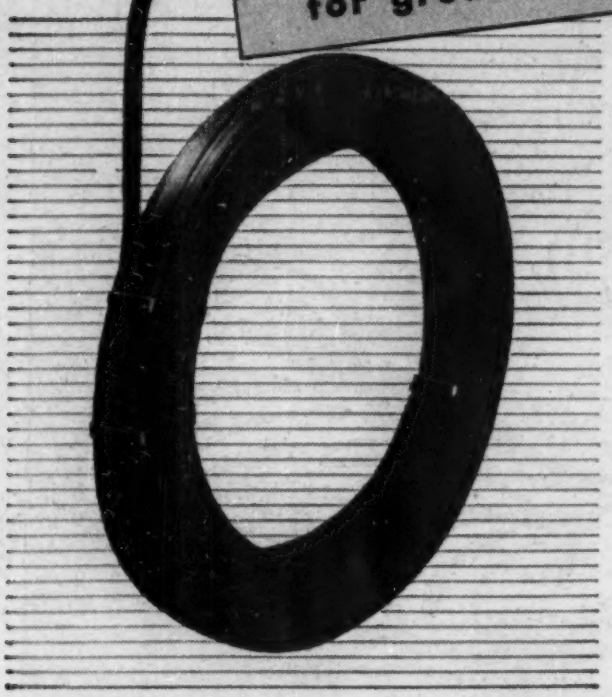

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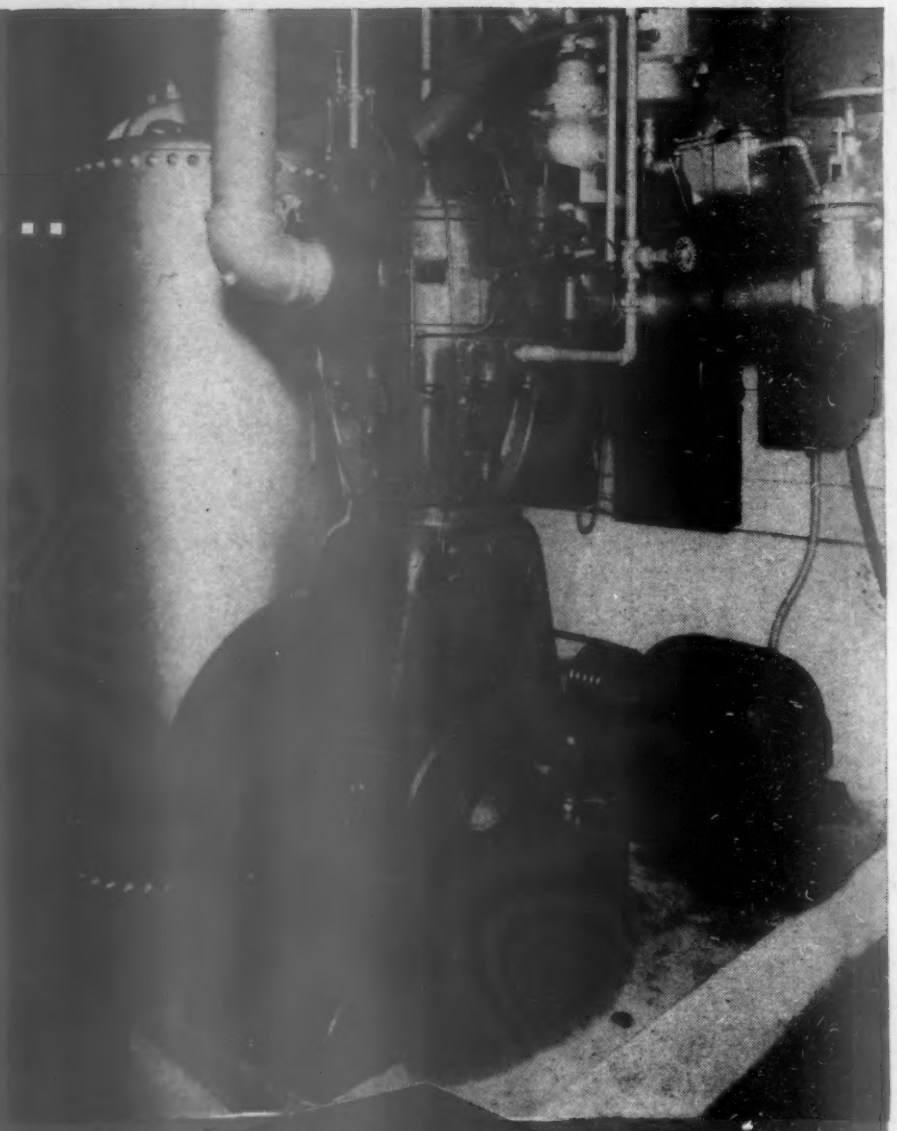

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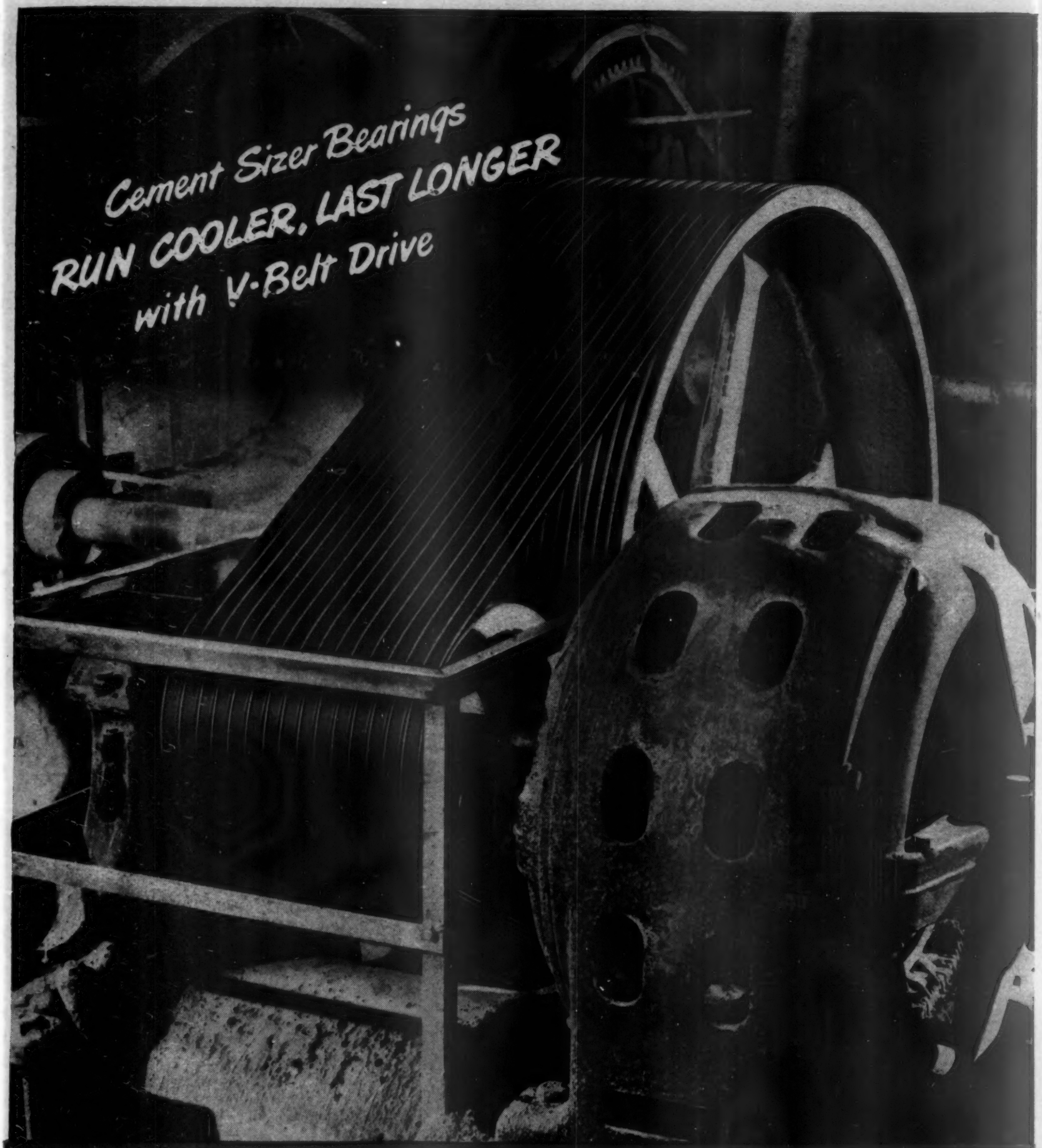

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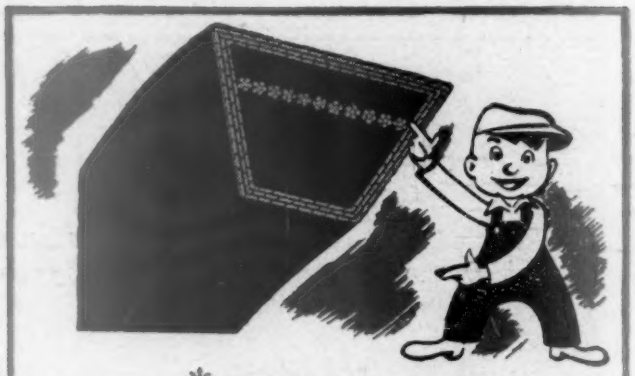

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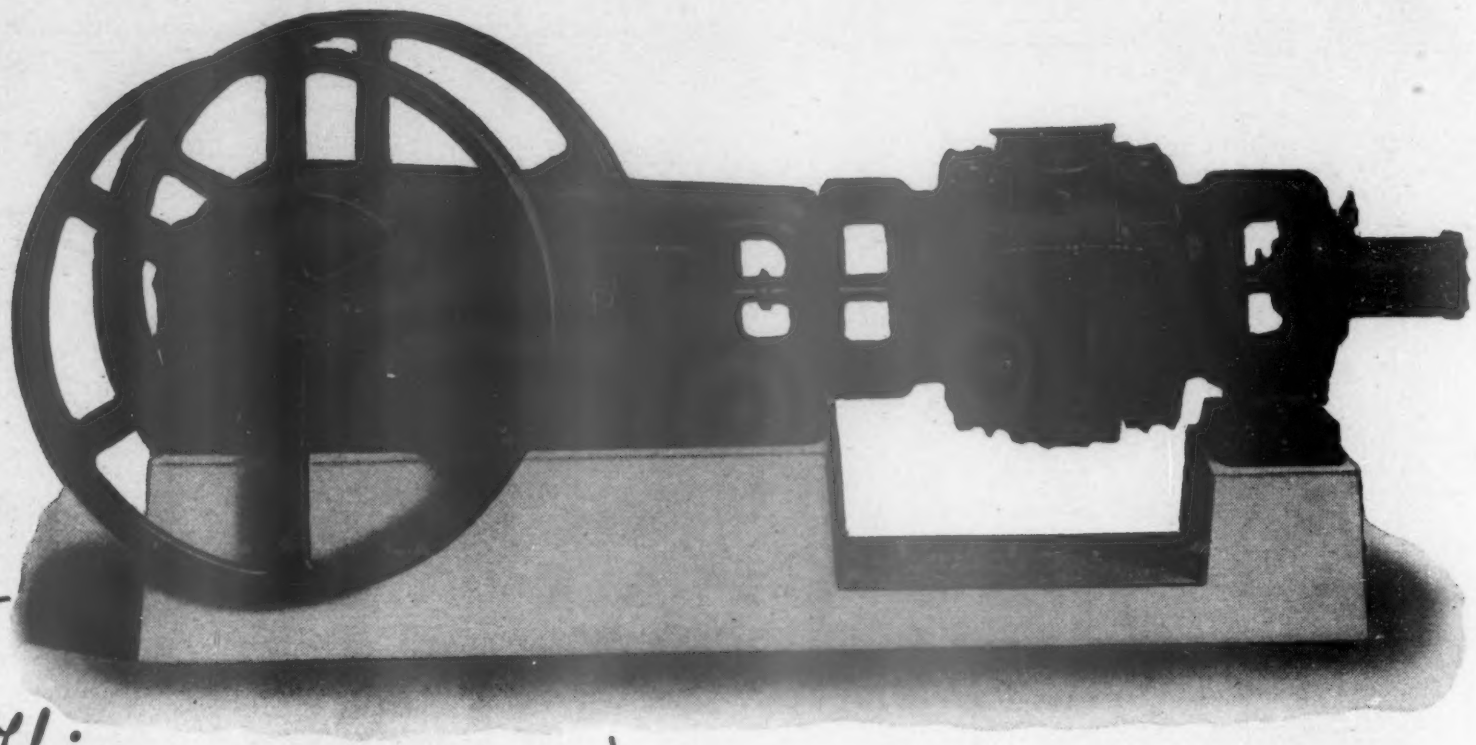

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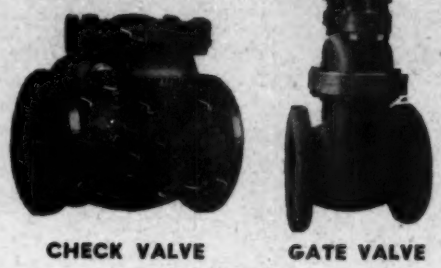

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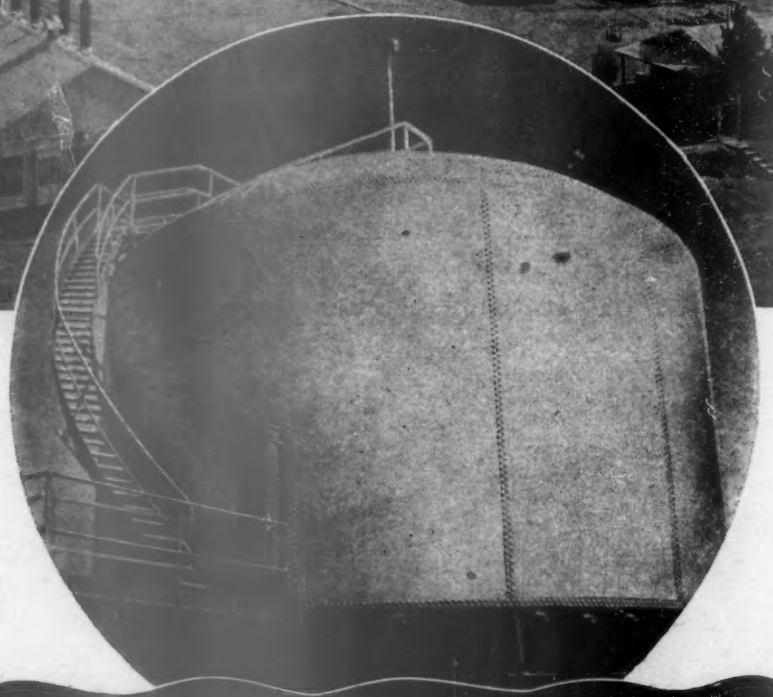

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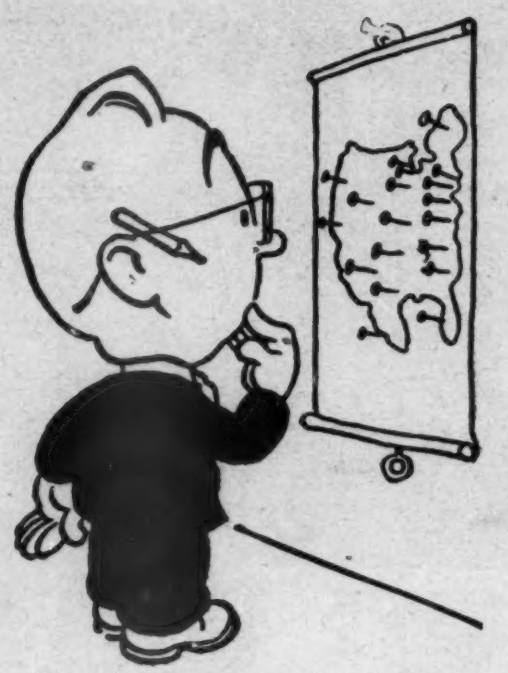

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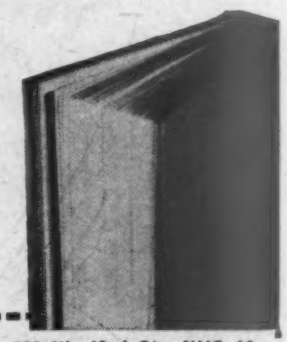

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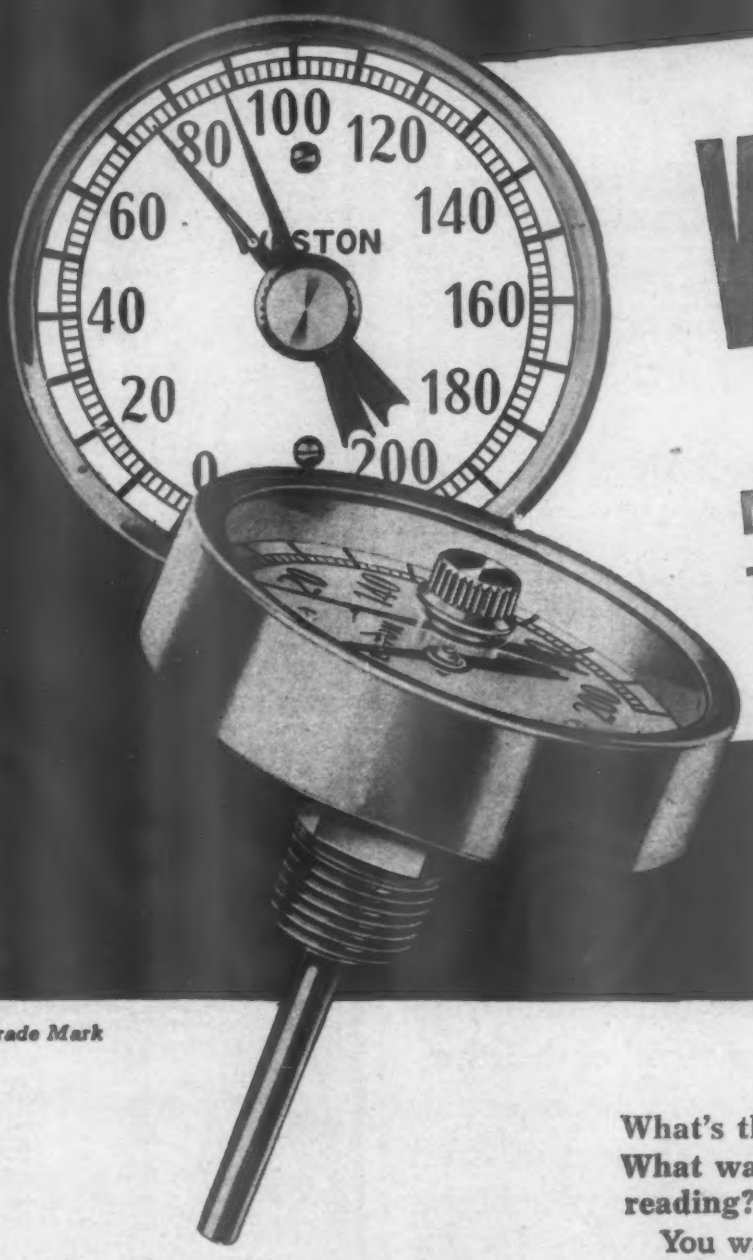

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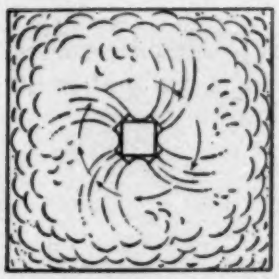
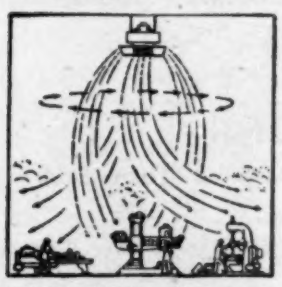


TOP VIEW Showing coverage.



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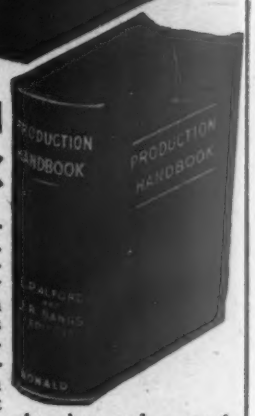

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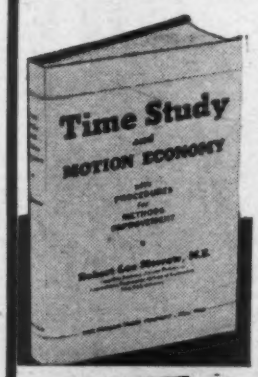

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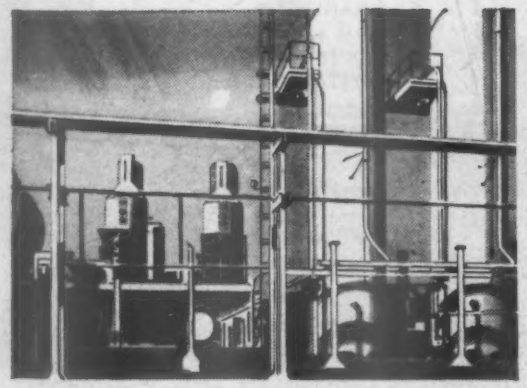
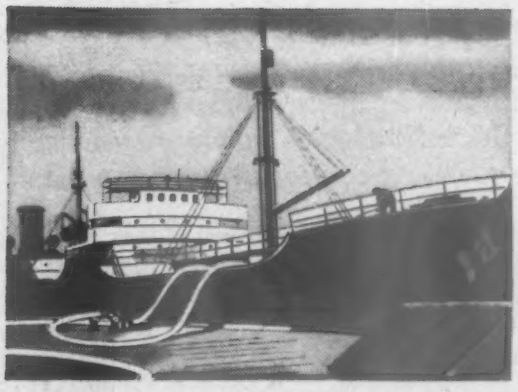
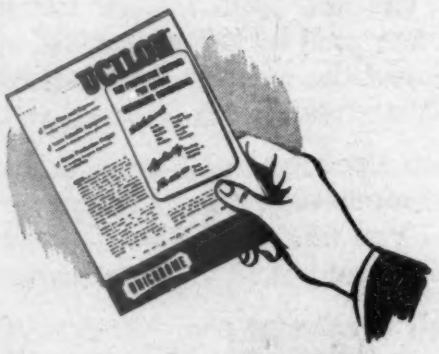


A LARGE OIL COMPANY applied Ucilon 400 to tanks, agitators, and other equipment subjected to acid and caustic spillage. Corrosion was stopped cold. They report that Ucilon is standing up where all other coatings tried had quickly failed.



ON THIS TANKER, Ucilon 400 was brushed on decks of wheelhouse, chartroom, passageways. When last inspected, the Ucilon coating was still in excellent condition—and at that time, had already lasted *6 times* longer than previous coatings!



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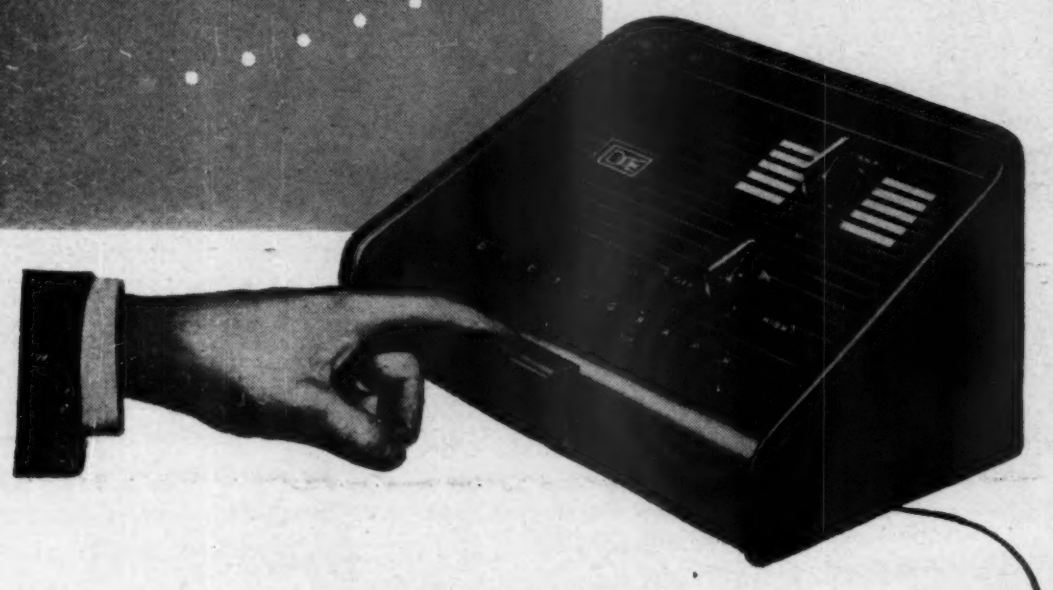

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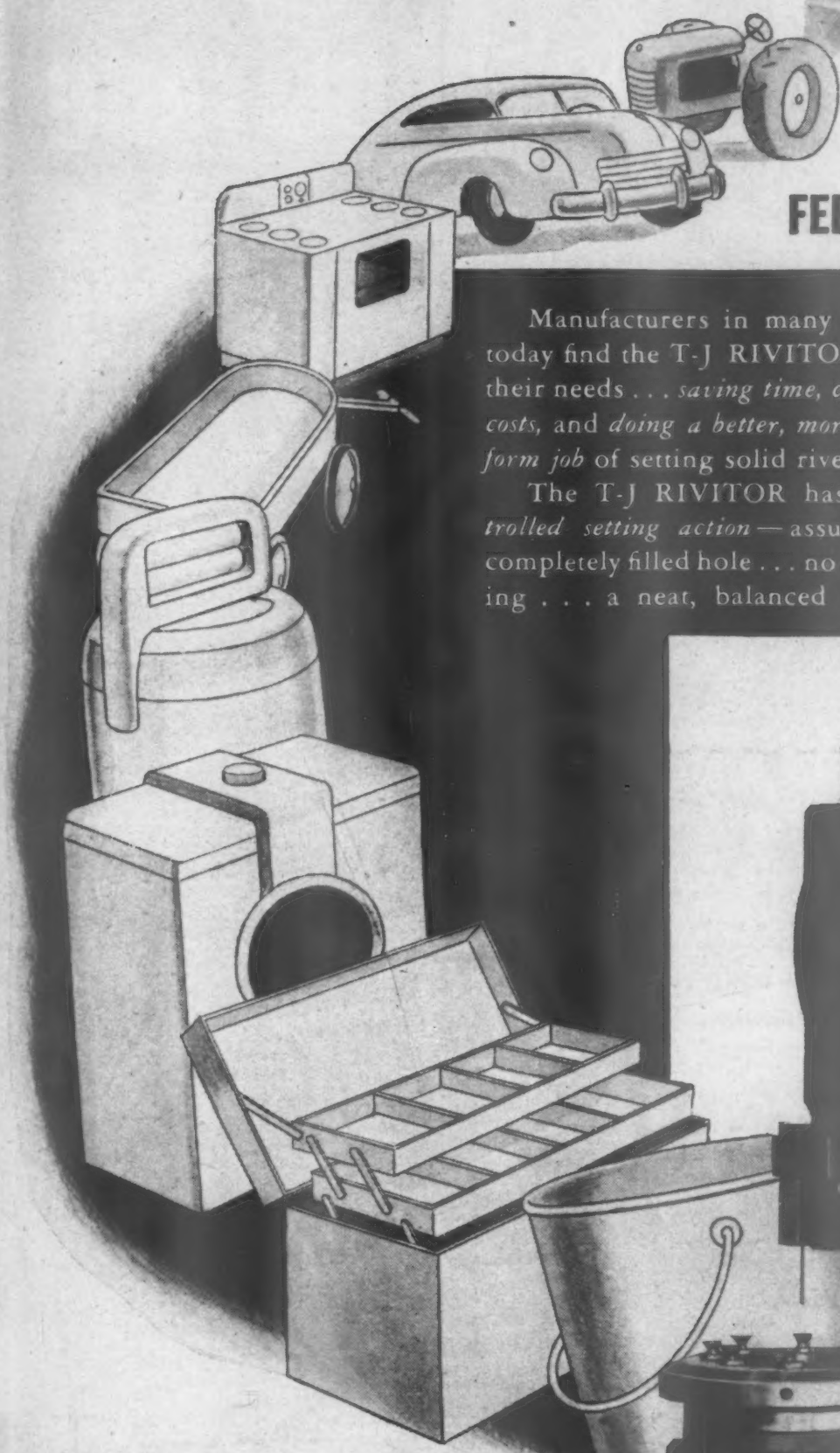

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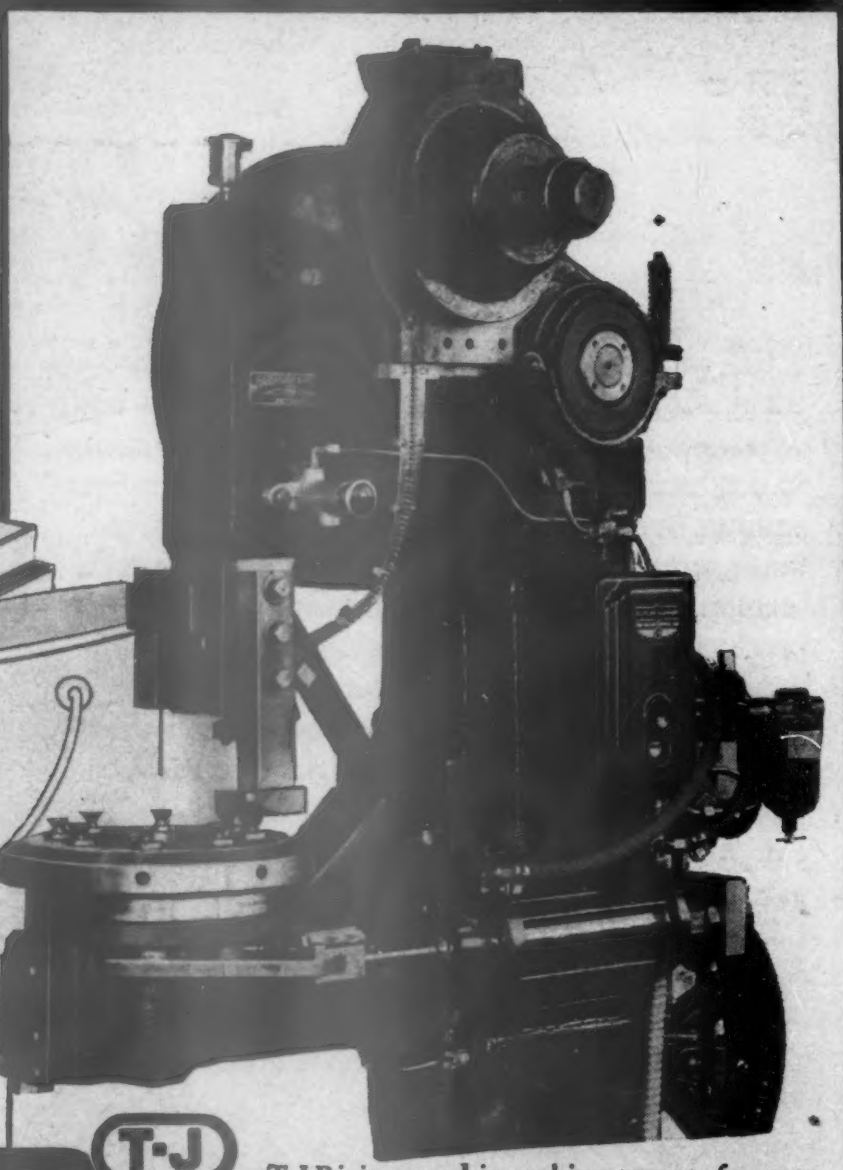

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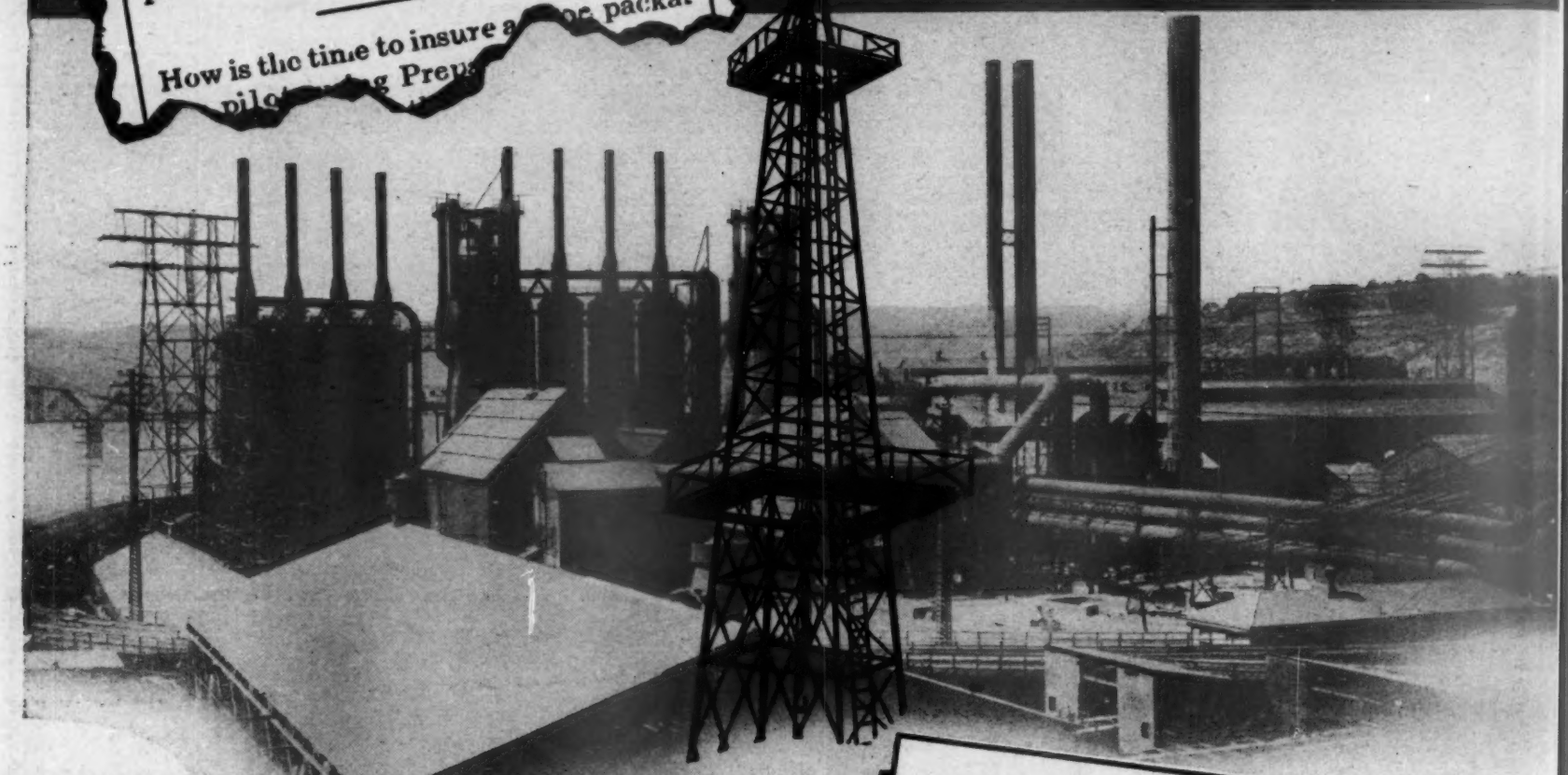

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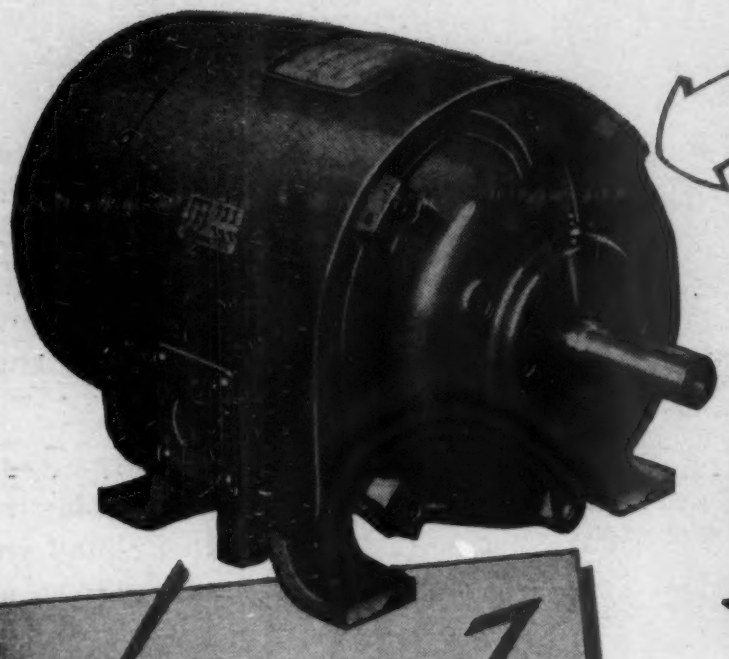
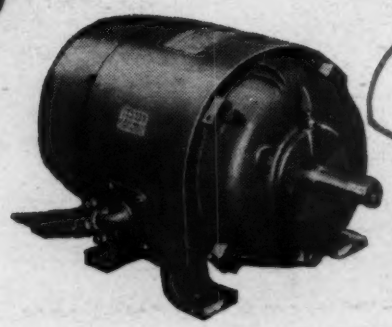


Simply remove external conduit box. Then remove knockout between the motor feet. When leads and connections are inserted, attach cover plate which comes with motor. For complete details, write for Bulletins C118—3039.



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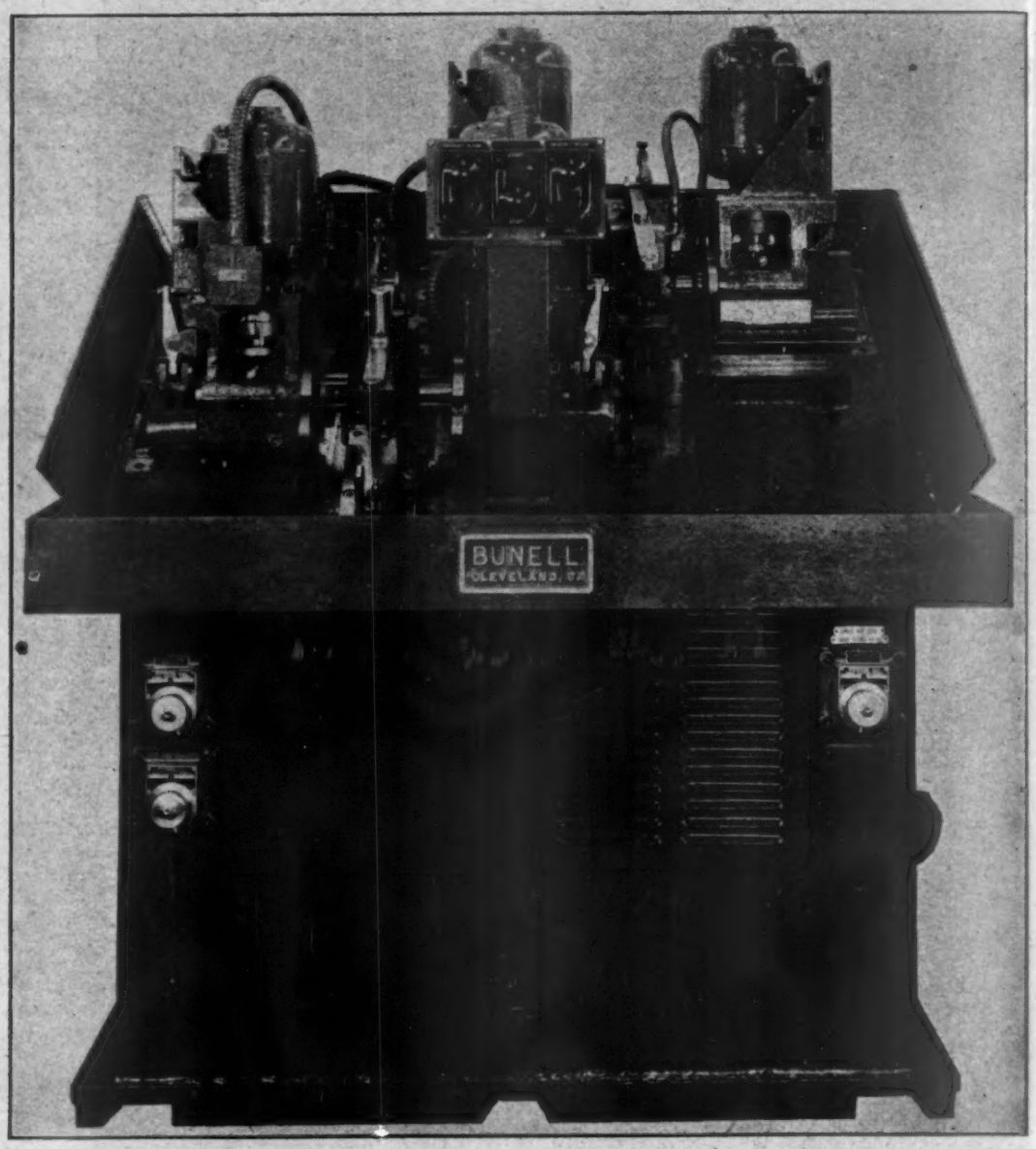

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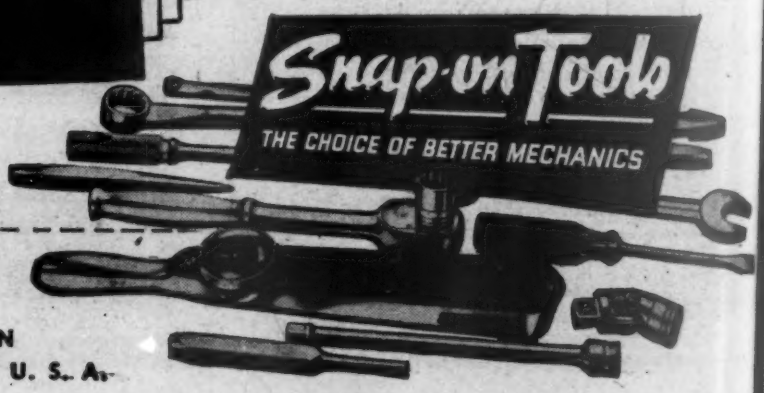

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Whether the project is to provide a fireproof, weatherproof exterior for a power plant or to glamorize an art gallery, Johns-Manville Corrugated Transite is *right* on the job. Use it inside, outside . . . on both new or remodeled structures.

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Made of asbestos and cement, practically indestructible materials, Corrugated Transite requires no preservatives . . . needs little or no upkeep. For further details, send for brochure. Johns-Manville, Box 290, New York 16, N. Y.

Because of unprecedented demand, there may be times when we cannot make immediate delivery. Please anticipate your needs.

EASY TO BOLT TO STEEL

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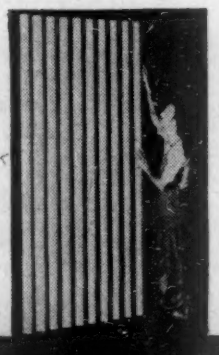
EASY TO DRILL

EASY TO NAIL TO WOOD



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Johns-Manville *Asbestos* **CORRUGATED TRANSITE**

Sheave to Transmit 1400 Horsepower . . .

. . . or a Belt for a 1/4 hp Compressor!

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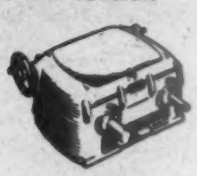
"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



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1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

The PLANNING BOARD

The Truscon Planning Board Says, "Normal delivery on many of our Steel Building Products is now possible. In fact, on all material for which raw material is readily available, a normal rate of production and delivery is currently in effect." However, since production and delivery schedules change from week to week, we suggest you contact the nearest Truscon sales office for the latest information.

Six Different Truscon Steel Building Products in this Job

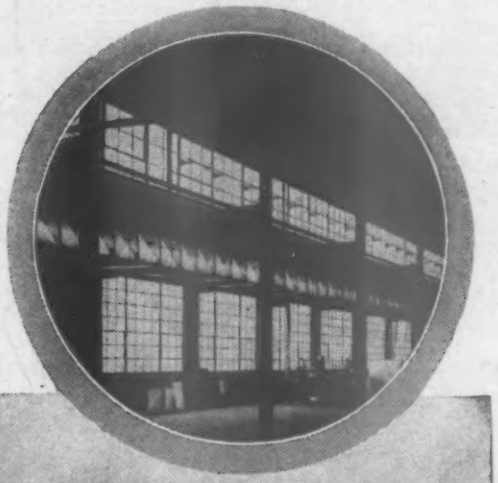
The Armstrong Furnace Company has just completed a fine new building in Columbus, Ohio, for the greatly expanded manufacture of its warm air furnaces. This well-designed structure is just about 100% steel, as far as the practical application of this material goes. R. W. Setterlin & Sons were the contractors. Truscon fabricated the structural steel members to exact specifications. Truscon "O-T" Open Truss Steel Joists permitted fire-resistant ceiling construction, especially since it was used with Truscon "Ferrobord" Steeldeck for the Roofing. "O-T" Steel Joists are very simple to install, being completely shop fabricated and reaching the job ready for placing. The "Ferrobord" Steeldeck then can be applied easily and quickly. It's adaptable to flat, pitched or curved roofs.

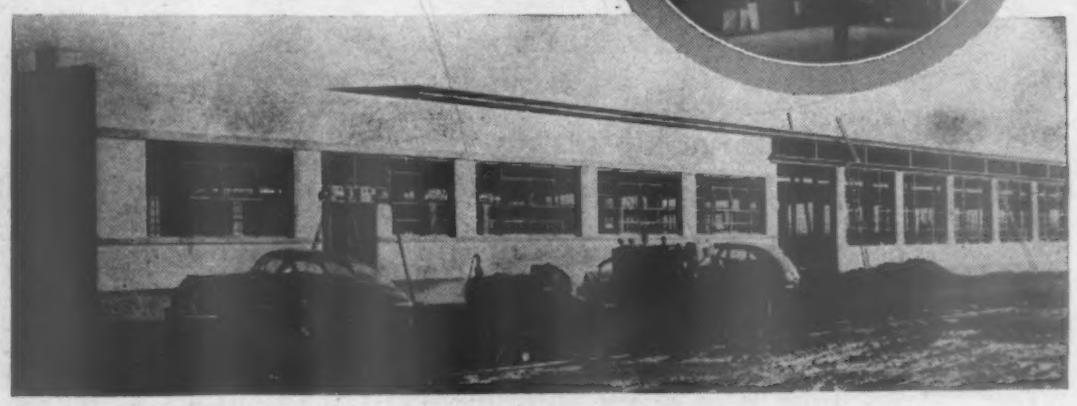
The Armstrong Furnace Company also makes generous use of nature's free light and air, through Truscon Commercial Projected Windows with Rack and Pinion Operators in the factory, and Truscon Architectural Projected Windows in the office building. The Commercial Projected Windows were used to reduce the hazard of accidents by trucks moving materials. The material handling trucks move very close to the inside wall of the building and any part of the window ventilator extending inward would create a potential accident risk. Thus the projected window with the ventilator projecting outward eliminates this hazard.

Efficient erection and completed enclosure of the structure was speeded considerably by the precision-made units fabricated in the Truscon factory, each item being made to fit without on-the-job retailoring.

If you are planning any kind of structure, it will be to your benefit to ask your Truscon representative to show how Truscon's complete line of steel building products and service can make your job easier and simpler. Truscon is the world's largest manufacturer of a complete line of steel building products.

Truscon Commercial Projected Windows from Interior of Armstrong Plant

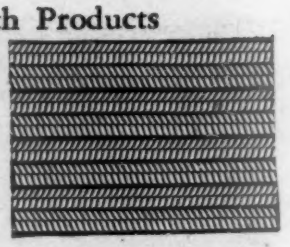




Exterior View of the Armstrong Furnace Company, Columbus, Ohio, Showing Truscon Architectural Projected Windows in Office Building.

Truscon Structural Steel in Armstrong Plant

Metal Lath Products



*Truscon Doublemesh *Herringbone Metal Lath*
**Reg. U. S. Pat. Off.*

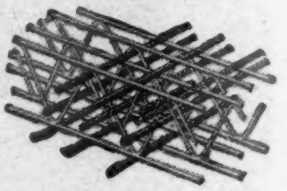
The recent series of fire tragedies in public buildings throughout America has pointed strong attention to fire-resistant construction. Truscon Metal Lath products are recognized by authorities for their fire-resistive qualities, especially for factories, office and industrial buildings of all types in congested areas. Truscon has a wide range of types of metal lath, corner beads, stucco mesh, corner reinforcements, hollow partition studs, base screeds, cold rolled channels and other products related to the plastering trades. All Truscon Metal Lath products are manufactured in accordance with U. S. Department of Commerce Simplified Practice Recommendation R 344. Write for free catalog showing the complete line, or refer to SWEET'S.

Truscon Adds New Metal Lath Accessories

Within the past few months Truscon has added equipment to fabricate short and wide flange bull nose corner beads, specia. base screeds, picture mold and casings. The addition of these products will enable Truscon to furnish a more complete line of Metal Lath Accessories. Write for free catalog.

Bank Vault Reinforcing

Where protection against unauthorized entry into a single room or an entire structure is paramount, use Truscon Welded Reinforcing. It assures maximum economy in the placing of construction materials, maximum efficiency of materials in resisting penetration, and No. 10 insurance rating.

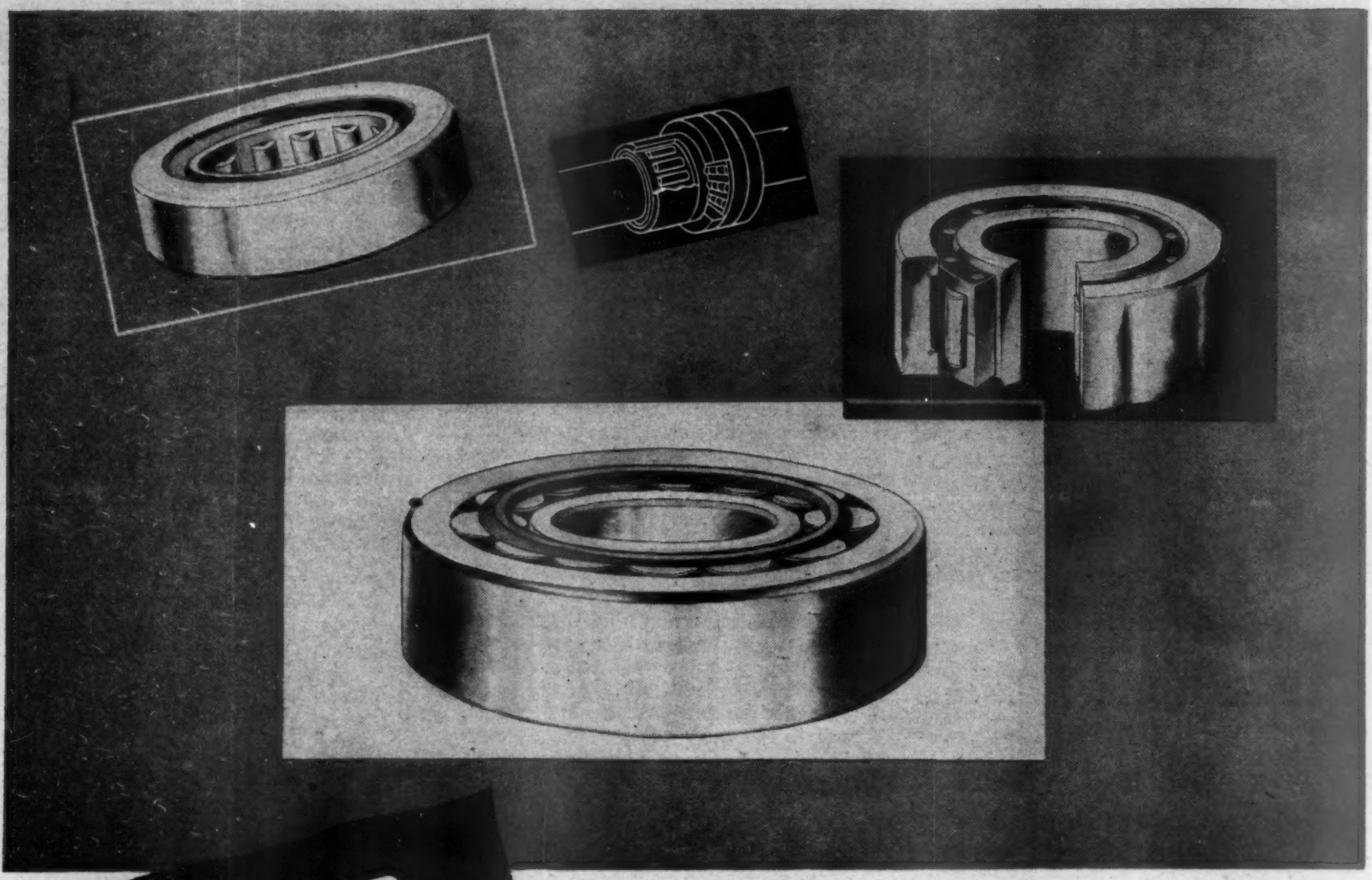


Truscon Welded Bank Vault Reinforcing consists of welded steel units placed parallel to each other with their chord members forming a barrier of steel near the inner and outer faces of the walls, floor and ceiling slabs. The web members of the welded units provide reinforcement through the thickness of the concrete. Loose bars threaded through the welded units form rectangular barriers of steel at both inner and outer faces of walls, floor and ceiling slabs as well as providing a transverse barrier through their centers. All walls are securely bonded together at the vertical corners by means of specially formed dowel bars. Write for new folder giving complete description of Truscon Welded Bank Vault Reinforcing.

New Literature

A new 32 page catalog on Truscon's complete line of steel doors is now available. Includes illustrations, installation details and specifications. Write for your copy today.

TRUSCON STEEL COMPANY
YOUNGSTOWN 1, OHIO
Subsidiary of Republic Steel Corporation



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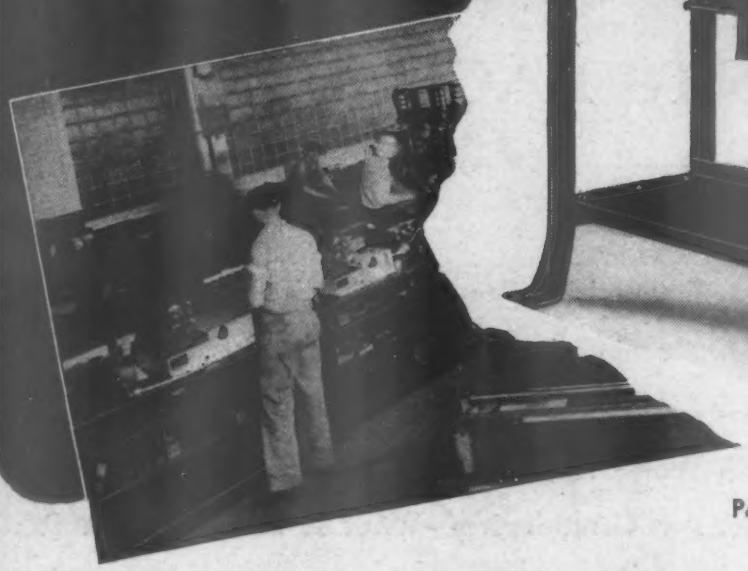

Fig.732
Pat. & Pats. Pending
Drawer is extra

SAVE YOURSELF THE TROUBLE AND EXPENSE OF
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specify HALLOWELL READY-MADE WORK-BENCHES OF STEEL

To thousands of users all over the country, the famous "Hallowell" Line signifies ready-made Shop Equipment of sturdy, steel construction, good design, years of wear and utility, attractive prices and the ability to meet practically every plant or shop requirement.

These exceptionally strong, sturdy "Hallowell" Work-Benches of Steel are designed to stand firm and rigid without costly bolting to the floor; and to withstand constant use and abuse. They have interchangeable sections . . . are made in five heights and widths and in seven standard lengths which can be moved easily and joined end to end to form a continuous work-bench of any length. More than 1300 combinations make it almost certain that you will find exactly the right bench for your requirements.

For complete information about "Hallowell" *ready-made* Work-Benches of Steel and the many other products in the "Hallowell" Line of Shop Equipment of Steel, write for the "Hallowell" Catalog.

"Unbrako" and "Hallowell" Products are sold entirely through Industrial Distributors.

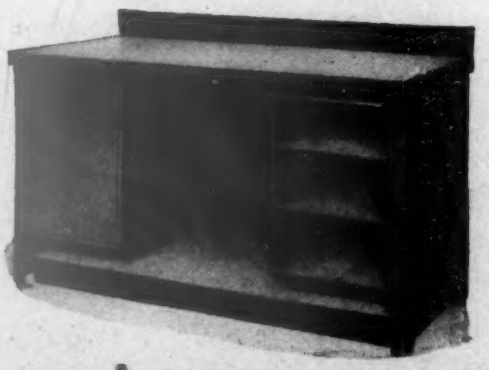

Fig. 1734

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PROPOSALS, $1.00 a line an insertion.

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Wanted by well-known firm of Consulting Management Engineers to conduct research studies in the field of scientific management, to formalize training of company staff and to hold clinics for selected client personnel, also some writing.

Preferred candidates for this position combine industrial and/or consulting with teaching experience and must have at least an M.S. degree in Engineering. This degree should be in Industrial Engineering or equivalent field and teaching experience should supplement M.E. degree.

Though headquarters will be in large Eastern city, candidate must be free to travel from and to base. Age group, 35-45.

Initial salary commensurate with experience. Please give full details which will be treated in strictest confidence.

P871, Factory Management & Maintenance
330 West 42nd St., New York 18, N. Y.

WANTED
MAINTENANCE SUPERINTENDENT

Ohio Plant has permanent position for man to take complete charge of plant maintenance department. Prefer graduate Engineer with experience in power, steam, design, general plant construction, maintenance of extensive machine equipment, hydraulic equipment, and building and building equipment. Should be experienced in handling of supervisory personnel in charge of the various phases of maintenance work. Submit letter of qualifications and experience to

P-853, Factory Management & Maintenance
520 North Michigan Ave., Chicago 11, Ill.

TEXTILE ENGINEER

A man who has technical training and practical experience in the construction of narrow fabrics and thread and cord. Must also have experience in grading same. Salary open.

P895 Factory Management & Maintenance
330 West 42 St., New York 18, N. Y.

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A man educated in the chemistry of dyeing fabrics. Must have had practical experience in the operation and control of commercial dyeing, particularly in the dyeing of narrow fabrics. Must also be experienced in direct, developed and vat dyeing. Salary open.

P874, Factory Management & Maintenance
330 West 42nd St., New York 18, N. Y.

POSITIONS VACANT

(Additional Positions Vacant Ads on page 340)

MAINTENANCE ENGINEER experienced in the design, installation and maintenance of foundry equipment, including sand and casting conveyors. Large southern plant. Excellent opportunity for experienced man. P-835, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

WANTED ONE electrical foreman to supervise a small Electric and Instrument Department in a modern chemical plant located in West Virginia. Must be familiar with modern electrical generation, switchgear, motors, and interlocking equipment; interested in, and capable of handling, work improvement methods and labor relations. P-886, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

WANTED ELECTRICAL engineer for construction and operation large industrial plant. Must be familiar with design layout and have operating experience. Qualifications and experience record must be submitted with letter of application. Address P-882, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

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SALESMEN INTRODUCED to better class clientele. Competitive Wiping Cloths and Waste, Cheese Cloth, etc. Profitable side line. Good commission. Hygrade Wiper Supply Co., 15 Greene Street, New York City. WALKER 5-1863.

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SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. D, 109 Church Street, New Haven, Conn.

EXECUTIVES—$5,000-$25,000: Your personal requirements in negotiations for better positions in all industries met via our individual procedures. Strict confidence assured. Details on request. Jepson Executive Service, 247 Porter Bldg., Kansas City 2, Missouri.

POSITIONS WANTED

QUALITY CONTROL—Young man, 36, desires position as Ass't. Director or Director of Quality Control. Thoroughly trained in statistical quality control. Past executive experience in inspection and quality control engineering field. Experienced in application of statistical quality control to varied industries, including chemical and precision manufacturing. Experienced in re-organizing inspection methods to reduce costs and improve quality. Actual records of past work available at interview. PW-883, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL ENGINEER—Well rounded experience as consultant and industrial engineer in variety of industries. Capable of heading staff or developing own personnel. PW-847, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER—7 years experience: Methods, planning, Time Study, Wage Incentives (including installation), Costs, Layout, Processing, Material Handling, Production Control. 4 years in Machine Shop, remainder in Rubber & Plastics, Woodworking and Mail Order. Also Consulting. Age 28. Salary $6000. BS Degree M.I.T. Interested in supervisory, sales engineer or Consulting work. PW-890, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

PRODUCTION ENGINEER: Fifteen years experience in Metal Stamping, Plastic Molding and Ceramic Manufacturing. Background includes Time and Motion Study, Production Methods, Cost Control and Plant Cost System. Married and employed. PW-889, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER with fifteen years in manufacturing and three years as a consultant is returning to the Los Angeles area. Would like to connect with small or medium manufacturing concern in a staff capacity, or with a firm of consulting management engineers. Have assisted may well known clients with their manufacturing and administrative problems. Have also supervised training and job evaluation programs. PW-888, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago 11, Ill.

EXECUTIVE ASSISTANT or Staff Executive 15 years experience in all phases of industry. Now employed as executive for medium size concern in large town. Wishes to locate a West Coast or small town. Has a thorough knowledge of Purchasing Sales, personnel, procedures and Administration. Age 35, college. A complete abstract available on request. PW-887, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 340)

WANTED
EXPERIENCED TIME STUDY MAN

Must be qualified in taking time studies and developing formulas, preferably in woodworking or assembly operation. Age 25 to 35 preferred. Permanent position leading North Carolina furniture concern. Excellent opportunity for advancement available to well qualified applicant.

Write P-831, "Time Study," care of Factory Management and Maintenance 330 W. 42nd St., New York 18, N. Y.

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Selling Experience Desirable But Not Essential

Nationally know manufacturer of production material wants man to advise customers on applications—not take orders—working in Michigan and Indiana, with headquarters preferably in Detroit area. Salary to be commensurate with experience.

Requirements: Varied knowledge of metalworking production gained by plant work or selling; ability to travel extensively away from home. Write in detail about background. Interview arranged at New York headquarters; expenses paid.

P894 Factory Management & Maintenance
330 West 42nd St., New York 18, N. Y.

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Experienced mechanical, chemical, or electrical engineers, under 30, for central staff engineering division of large Midwestern corporation. Must be capable of becoming specialists in some phase of Company's processes or equipment. Will direct design, layout, and development of equipment. Give full details in first letter. Replies held in confidence.

P878 Factory Management & Maintenance
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WANTED

Cost Analysis and Time Study Man

for textile mill (throwing) in Pennsylvania.

Following qualifications desirable:

(a) Industrial engineering training and experience.

(b) Knowledge of time study.

(c) Knowledge of textile industry (spinning, doubling).

(d) Potential leadership and executive ability.

Position considered as training for more responsible management position. State education, experience, references.

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Engineering graduate 50, presently employed, successful record with nationally known concern in metal trades industry. Thoroughly grounded on sound organization policies, accustomed to supervision of large groups and able to maintain wholesome human relations. Experienced in directing manufacturing, engineering, sales, accounting and industrial relations.

PW873, Factory Management & Maintenance
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AVAILABLE

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Manufacturing Executives—If You Want Leadership In Your Plant, If You Want To Produce A Better Product At Low Cost, You Will Be Interested In A Record Of Results. Address

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AVAILABLE—SALES REPRESENTATION CHICAGO AND MID-WEST

Have established office, experienced personnel having contacts with large and small industrial concerns, financially responsible. Seeking mechanical items on exclusive commission basis.

RA879, Factory Management & Maintenance
520 N. Michigan Avenue, Chicago, Illinois

WANTED RESEARCH ASSISTANT

Old estab. mfging concern in mid-west requires the services of a qualified person for the position of Ass't Head in the Physical Laboratory. Applicant must have Chemical Eng or Metallurgical degree and be interested in analytical and research work. Knowledge of foundry and machine shop practices desirable. Salary commensurate with individual's qualifications. Please submit complete information in your reply which will be treated confidentially.

P875, Factory M & M, 520 N. Mich Ave, Chic 11, Ill

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ADMINISTRATIVE ASSISTANT

Production control. 6 years broad experience with all phases of supervision scheduling, research, coding, methods and procedures, sales and costs analysis, systems, payroll, perpetual inventory, etc. Best references from nationally known corporations. College education, 31, married.

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British subject with connections throughout British Isles wishes to represent organizations manufacturing machines and equipment for engineering industries, including mining, automotive, electrical, transport and general engineers. Would discuss possibilities of manufacturing rights in Great Britain.

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This thoroughly organized confidential service of 37 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

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276 Dun Bldg. **Buffalo 2, N. Y.**

POSITIONS WANTED

(Continued from page 339)

SUCCESSFUL FOREMAN and Staff Specialist conversant with many manufacturing functions invites correspondence that might develop into a connection with more responsibility, opportunity, security, and compensation. Experience with outstanding firms, persistent student, member A.M.A. Age 37. PW-885, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

CHIEF COST estimator—Technical education, 14 years experience in time study, production planning cost and methods analysis and estimating in precision and commercial, job shop and high production machining, flat metal fabrication, assembly and tooling with thorough knowledge of all types of machinery and establishing manufacturing standards. Will also accept foreign assignment. PW-884, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

COST ENGINEER, with comprehensive sound experience in effective financial controls, interested in position of major responsibility. University graduate. PW-881, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER M. E. graduate 10 years intensive experience administration, production, plant layout and planning, scheduling. Also Personnel and Labor Relations Director light metals field. 32, seasoned. Seeking position of major responsibility with substantial firm offering unlimited future. PW-880, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

LABOR RELATIONS specialist—LLB, age 34. Extensive experience successfully handling all phases of labor-management problems, contract negotiations, personnel matters, etc., including wide background in NLRB hearings, procedure and practice. Desire position as labor relations personnel director. PW-879, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

AGGRESSIVE PRODUCTION manager experienced in deep drawing, die and tool design, hot dipped galvanizing, sheet metal stamping and a wide range of metal fabrication, particularly home appliances, capable of coordinating all departments into a smooth working efficient plant. Excellent operating record can stand thorough checking. Proven record of handling personnel up to 1000. Well qualified in wage incentives, production standards, quality requirements, job evaluation and operating cost controls. Age 31. Will accept foreign assignment. PW-892, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N. Y.

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(Additional For Sale Ads on opposite page)

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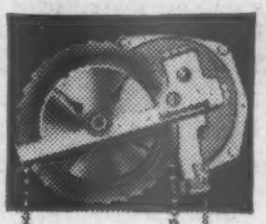

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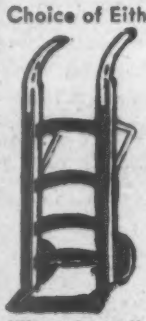

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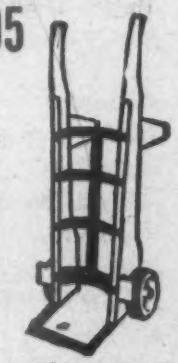

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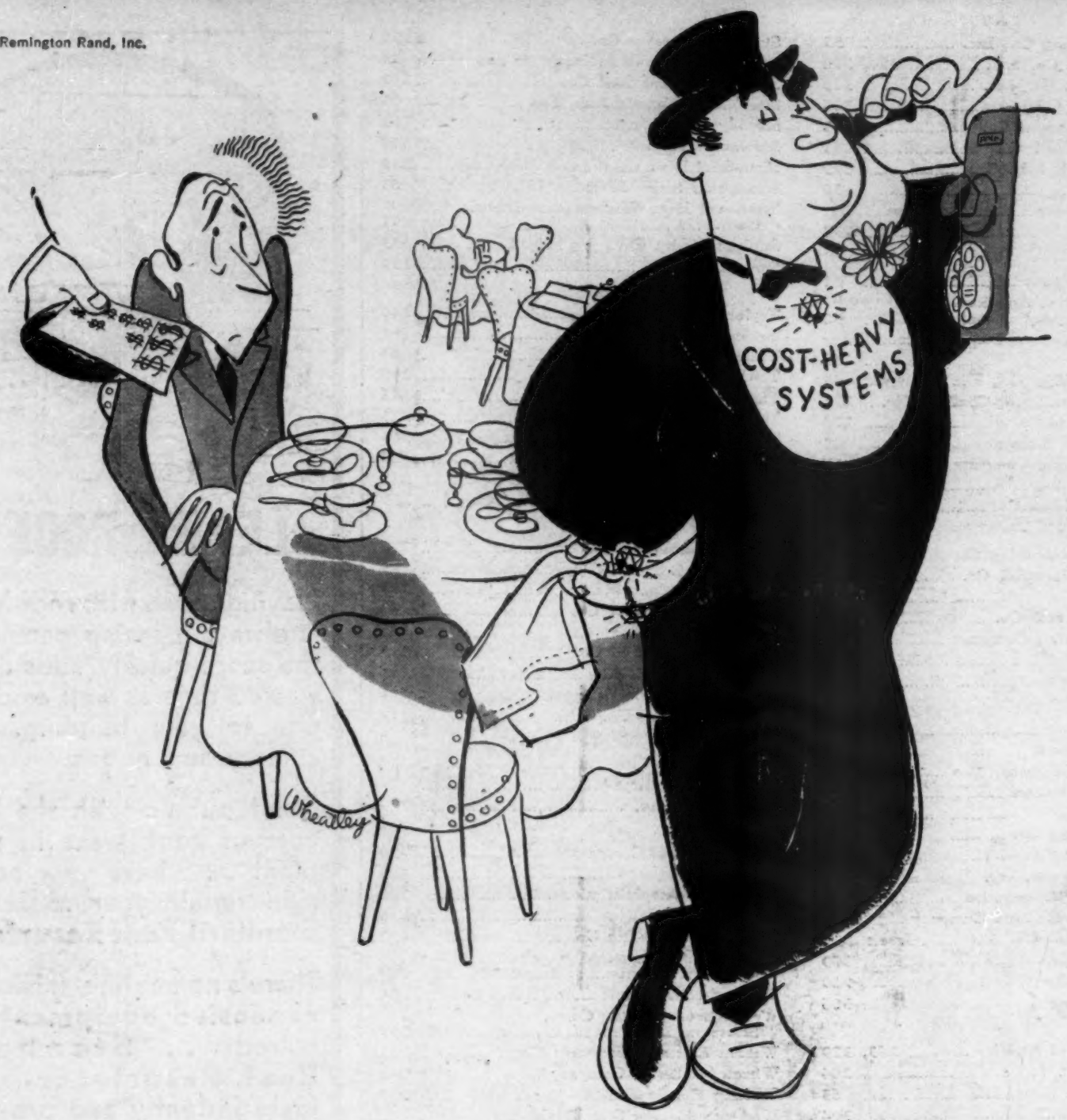

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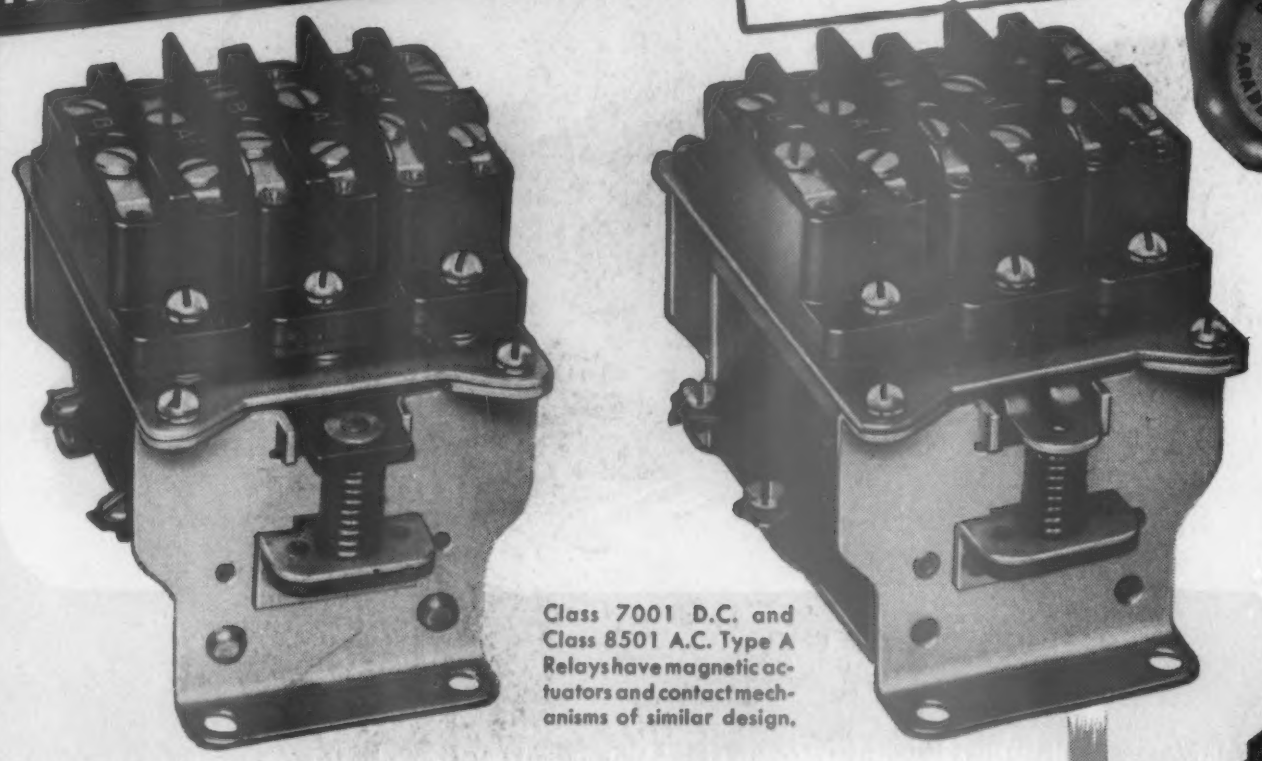

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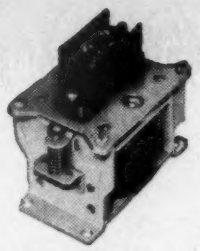
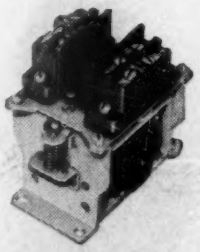
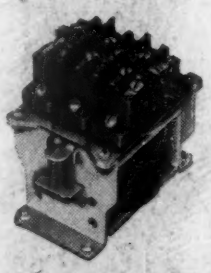


1 Pole, Double throw, D.C. Class 7001 Type AO-1



2 Pole, Double throw, D.C. Class 7001 Type AO-2



3 Pole, Double throw, D.C. Class 7001 Type AO-3

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